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DEPARTMENT OF TRANSPORTATION AND RELATED AGENCIES APPROPRIATIONS FOR 1994

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BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRD CONGRESS

FIRST SESSION

SUBCOMMITTEE ON THE DEPARTMENT OF TRANSPORTATION AND RELATED AGENCIES APPROPRIATIONS

BOB CARR, Michigan, ***Chairman***

RICHARD J. DURBIN, Illinois	FRANK R. WOLF, Virginia
MARTIN OLAV SABO, Minnesota	TOM DELAY, Texas
DAVID E. PRICE, North Carolina	RALPH REGULA, Ohio
RONALD D. COLEMAN, Texas	
THOMAS M. FOGLIETTA, Pennsylvania	

DELACROIX DAVIS III, RICHARD E. EFFORD, CHERYL L. SMITH, and LINDA J. MUIR,
Subcommittee Staff

PART 8

TRANSPORTATION ISSUES

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DEPARTMENT OF TRANSPORTATION AND RELATED AGENCIES APPROPRIATIONS FOR 1994

THURSDAY, FEBRUARY 4, 1993.

INTRODUCTORY REMARKS

Mr. CARR. I would like to call this Committee into session. This is the very first session of the Appropriations Subcommittee on Transportation, and I would like to, in addition to welcoming all of you here, do a little housekeeping business that we need to do.

We are going to stall a little bit because I know Mr. DeLay is on his way and I don't want to get too far without him being here. And here he is. I have been stalling for you, waiting for you.

Mr. DELAY. Oh, one minute late. Sorry, Mr. Chairman.

Mr. CARR. That is quite all right.

I was saying, Tom, inasmuch as this is our first, very first meeting of the 103rd Congress for our Subcommittee, I wanted to get a few housekeeping matters out of the way for those who might be with us today who regularly follow our hearings.

We are under some severe time constraints for both a supplemental, which is expected to be before us, and the fiscal year 1994 budget, and it is going to require the Committee to do double-time work, and work in an expedited way.

We assume we will have the President's economic plan in detail soon after his State of the Union, but we are told that we won't get budget numbers until March 23. Yet Chairman Natcher has asked us to be ready to complete our work through the House by the end of June. So, to those of you who know the work of this Committee and know how we usually start right about now on our budget hearings, this year's budget request is going to be delayed.

Happily, it gives us some opportunities to have hearings such as this one, which I will get into in just a minute. I just want to announce on the record what I think all the members of the Committee know, is that, as a general rule, we will be holding hearings Mondays through Thursdays, and I will endeavor to guarantee Fridays will always be free and as many Mondays as we can grant will be also free of any formal Committee business.

Also, as a general rule, we will want to start at 9 o'clock on Mondays through Wednesdays and go until noon, where we would hope to break for an hour and come back from 1:00 to 2:00 or 2:30 Mondays through Thursdays. On Thursdays, we will probably start around 10 o'clock, if that meets with the approval of the Committee.

I also want to point out on the record, which I will do again and again throughout the Committee hearings, that it will be my practice to recognize members in the order in which they show up for the hearing rather than in the order of seniority, giving some slight incentive to be here.

Before going much further, I want to say how delighted we are to have a new member on the Democratic side, my good friend and colleague of many years, Tom Foglietta, new to the Committee and new to this subcommittee. Tom and I have known each other for a long time, going back to an event I will always remember on the Capitol lawn, and that was the U.S. Football League, in those days, and the Pontiac Panthers were playing—was that their name?

Mr. FOGLIETTA. I don't remember it offhand.

Mr. CARR. There was a UFL team from Philadelphia, and Tom and I had a friendly bet, and we won and we were treated to a wonderful lunch from Bookbinders on the Capitol lawn.

Mr. FOGLIETTA. I think you made out better than most of the players on that team.

Mr. CARR. Anyway, we welcome you, Tom, and I will recognize you in a minute for any remarks you want to make.

I want to also explain that our Ranking Minority Member, Frank Wolf, would be here but for the fact that one of his constituents was one of the tragic victims of the shooting at the CIA entrance the other day and right now there is a memorial service. Frank is there and will be with us as soon as possible. But standing in for Frank is Tom DeLay.

And, Tom, I recognize you for any remarks you want to make.

Mr. DELAY. Well, Mr. Chairman, since this is the first hearing, I want to express my excitement that you are chairman of this subcommittee and——

Mr. CARR. I hope people don't take that the wrong way.

Mr. DELAY. We had an excellent chairman, Chairman Lehman, who we all know, that did a wonderful job with this subcommittee and we wish him well, but, Mr. Chairman, you have built a reputation of being an independent thinker and hard worker and you really look at the issues in depth and the projects in depth and take, sometimes, some very unpopular positions when you think we are overreaching.

So we are looking forward to a great tenure out of you, Mr. Chairman, and after you introduce the panel, I would like to make a statement.

I also welcome Tom. You will find that this Committee is a very collegial committee and works very well together, and when and if our new member shows up, I will introduce him.

Mr. CARR. All right. Tom, would you have any remarks to make?

Mr. FOGLIETTA. Just very briefly, Mr. Chairman. I am very happy to be here working with you and other members of the Committee. I realize the tremendous amount of work we have to do, and I know you are up to being the chairman of this subcommittee because the reputation you have developed over the years and, as our colleague said, you are a person who is very concerned and a very hard working person.

So I am looking forward to working with you, members of the committee, and I look forward to the years ahead which I believe will be productive for the people of this Nation.

Mr. CARR. Well, thank you for those kind remarks.

Before proceeding, I want to also introduce the new, and for that matter, the continuing staff members. We couldn't do our work on this subcommittee, particularly under the time constraints that we have without a great deal of professional help, and we are very proud of our staff.

Returning in the 103rd Congress, Rich Efford, I think most of you know Rich; and Linda Muir. We have two new staff people. We also want to acknowledge the great service Tom Kingfield made to this Committee over the years. In fact, there has never been a Department of Transportation appropriation that didn't have his fingerprints all over it. He was on the staff when the Department was formed and was its first staff clerk. Tom has just recently retired but remains, by his promise to me, available to us to get us out of any hot water we find ourselves in.

But Tom's replacement as Clerk of the Committee is Del Davis, sitting to my left. And Del, some of you may know, came to us from the Defense Appropriations Subcommittee, where he had a particular expertise in acquisition and procurement, something which we will use mightily here.

In addition, we have Cheryl Smith, who is new to the Committee and a new professional staff person. She worked for Congressman Lou Stokes on the Hill and has had Hill experience with the U.S. Senate Committee on Labor and Human Resources. Most recently, she has been a member of the Virginia Department of Planning and Budget, and we look forward to working with Cheryl as well.

With that, unless there are other introductory or housekeeping type remarks, I think we will get to the business at hand.

THURSDAY, FEBRUARY 4, 1993.

INFRASTRUCTURE, INVESTMENT, AND ECONOMIC DEVELOPMENT

WITNESSES

DR. RUDY PENNER, POLICY ECONOMICS GROUP, KPMG, PEAT MARWICK

DR. CHARLES R. HULTEN, DEPARTMENT OF ECONOMICS, UNIVERSITY OF MARYLAND

DR. ROBERT M. SCHWAB, DEPARTMENT OF ECONOMICS, UNIVERSITY OF MARYLAND

HARVEY BERNSTEIN, PRESIDENT, CIVIL ENGINEERING RESEARCH FOUNDATION

OPENING REMARKS

Before we introduce our first distinguished panel of witnesses, I would like to make a brief statement about the objectives of this hearing.

The Clinton administration has announced that it intends to unveil its economic plan on February 17, and it is expected that part of the plan may include a 1993 stimulus proposal. The exact size and composition of the package is not yet known, but media reports suggest that it is likely to include some level of funding for transportation programs.

There is already talk of trying to have a stimulus bill enacted by late March. It will not be easy to meet such a tight schedule. Nevertheless, we on the Appropriations Subcommittee on Transportation pledge to cooperate with the new administration and we will be ready to respond to whatever proposals the administration submits.

It is always easy to find proponents of programs to testify on their behalf, and we could have asked, as our first hearing, all of those groups to come before us and tell us what their interest in transportation is and how much more money we could spend in that area that they are most concerned about, but we have not really done that. Other committees have done that, and I am sure they will continue to do that.

What we have done is to try to gather together this morning, as our first hearing, a group of individuals who have given considerable time and thought to the relationship between infrastructure spending and its impact on our economy.

Rather than respond automatically to a campaign promise or to try to solve today's problem with yesterday's answer, we would like to develop some information which will indicate exactly what range and type of short-term benefits accrue from infrastructure investment at this time in some kind of a stimulus package.

We also want to determine what the long-term benefits will be of additional investment now. Just because there may be an opportunity to provide additional funding for transportation infrastructure doesn't necessarily mean we should do it.

What we hope to have today is a full and wide ranging discussion which will help to provide the intellectual framework in which to consider the following questions:

First, if there is a short-term job creating stimulus bill, what is the appropriate level of funding. In other words, in the short-term, how much additional money can be effectively and wisely utilized without taxing short-term capacity, reducing competition or driving up prices?

Further, in terms of short-term surge, how many jobs will actually be created versus how much money will, in fact, be unspent or economically underutilized or diverted to non-job producing costs like right-of-way or wetlands mitigation?

And, finally, for a short-term stimulus package, is the authorization in ISTEA, unamended, sufficient to do the job?

The experience of the Emergency Jobs Act of 1983 should be recalled on this first question as we rush to stimulate the economy and create employment. The GAO concluded that the 1983 Act "was not effective and timely in relieving the high unemployment caused by the recession. Funds were spent slowly, as is typical for a lot of public works programs, and few jobs were created when most were needed in the economy." The GAO also found that about half the funding provided in the Act remained unspent two and one quarter years after enactment.

Funding which may be included in the stimulus bill for infrastructure will not be available for other purposes. So the question arises, should infrastructure funding be singled out for special treatment or should it be required to compete with other efforts which can improve living standards, such as health care or reducing the deficit or other trade-offs?

The second question we would like to deal with is: What criteria should we use to improve our long-term infrastructure investment decisions? How can we measure the rate of return to the economy? How can we be sure that we are getting the best use of the marginal dollar? How can we measure to assure that public infrastructure investments result in greater productivity or lower cost than other public or private investment that it might displace?

Some of our witnesses today probably believe that public investment is the engine that drives all economic growth. Others believe that the relationship between public investment and economic growth is minimal, at most. We hope today to focus on the limits of what is possible and what is advisable.

I just want to point out a book which many people have read, and I have read, "Adventures in Porkland." Now, I love Pat Oliphant, and that is quite a caricature of someone who sits behind this desk. I don't take it personally. I don't smoke cigars. There is a cigar there.

And then if you read the book by Brian Kelly, which is very thought provoking, and I have read much of it twice. It is itself a prose cartoon of what goes on here. But, unfortunately, this is the image that people have of the Congress and of this Committee. The American people in the last election said they didn't want business as usual, they wanted us to do things a different way and they didn't want us to come to Washington and play political games with their money.

Well, this hearing is key, and that is why it is the first one. We want the advice and counsel of people, because you won't find it in this book. This book contains virtually no constructive criticism. It points out problems, but there is virtually no path to a brighter day in this book. And, to be sure, we are probably never going to take politics out of politics, but we do seek the advice and help of those who have thoughts about how we can do a better job.

If politics isn't the best criteria to decide whether we build a road or a bridge or an airport, what is the criteria? Is it any better to do it by formula? I can sit here and tell you—I think Tom can, too, both Toms—that there is pork in formulas. How you decide the formula decides how the money swings. There is an agenda there.

What we are really trying to ask all of you today is to give us the benefit of your best thinking and advice on what investment grade criteria we can apply. Not that we will always be successful, but, in my brief review of some of the literature, I might say that we have not translated what literature there is to actual practice in the Appropriations Committee, and I might say that the literature is a little thin on practical political help for this problem.

Our time is short and the topic I have just outlined is large, so I would ask our distinguished witnesses to summarize their thoughts on these two questions. I assure you that I have read most of the testimony and am prepared to discuss it with you, and at the risk of appearing rude, I will try to help all the witnesses today to remember that that is our prime focus.

This hearing is not about how great the needs are. We will all stipulate to that. The purpose of this hearing is not to talk about how we ought to have a larger more dedicated source of revenue. We will probably all agree to that too. It seems to me, though, as we are looking forward, we have to figure out how, assuming we don't have new revenues and assuming that we have these great needs, how do we apply the available dollars in the most economically productive way, not just the politically productive way.

Before that, I would like to recognize Ron Coleman, who just arrived. Do you have any opening remarks?

Mr. COLEMAN. No, I don't. Thank you, Mr. Chairman.

INTRODUCTION OF FIRST PANEL

Mr. CARR. I would like to introduce our first panel of distinguished guests. Dr. Rudy Penner of the Policy Economics Group with KPMG Peat Marwick, thank you for being here; Dr. Charles Hulten, and Dr. Robert Schwab, both of the Department of Economics, University of Maryland. Also joining us is Mr. Harvey Bernstein, President of the Civil Engineering Research Foundation.

I might say the panels were constructed without any kind of hidden agenda. It is totally for the convenience of processing testimony. No one should draw any conclusions by any juxtapositions that might come from this.

Since you are first on the list, Dr. Penner, would you please start?

STATEMENT OF DR. RUDOLPH PENNER

Dr. PENNER. Thank you, very much, Mr. Chairman, it is a pleasure to be here. Mark Twain once said that all generalizations are wrong, including this one. The problem with infrastructure investment of all types is that it is impossible to generalize about their value. The word infrastructure covers everything from the space station to the interstate highway system to the recently contemplated investment in Lawrence Welk's house. Indeed, it is a word that is so broad that it encourages fuzzy thinking.

Federal transportation infrastructure investment has seen triumphs, such as the interstate highway system, and waste, such as in the Tombigbee waterway. But even within a program, such as the interstate highway system, some segments are very much more productive than others.

This implies there is no way to judge investment spending except through very careful individual project evaluations. Those evaluations must not only judge the associates and economic benefits and costs of a project, but must also indicate whether Federal financing is appropriate.

Alternatives include State and local funding, where it is clearly their responsibility; using cost financing, where that can be accomplished at low cost; or private ownership and operation. Once a rate of return to a project is determined, it should ideally be compared to the rates of return on everything else that government might spend money on, but that is, of course, humanly impossible. However, a simpler standard might be to ask, "Is this project truly more productive than deficit reduction?"

There are two political imperatives that inhibit making decisions using only the objective analysis described above. First, it is difficult to get a program passed in our democracy unless it can be shown to benefit a very large portion of the Nation. That means it is impossible to rank projects according to the rates of return shown by project evaluations, doing only the best projects that fit within a limited budget.

The benefits must be spread around, and that means doing some relatively low rate of return projects while ignoring some with higher rates of return. This creates an inherent inefficiency in our public investment programs and, in a day of very limited budgets, it means that we must proceed very carefully.

A second problem arises, because we all know how hard it is to cut back a program once it gets started. That too suggests extreme caution.

I do not want to claim to be an expert on the highway program, but my own interpretation of recent events that the system was clearly deteriorating in the early 1980s but we reacted by increasing the gas tax in 1983 and again in 1990 with the budget agreement. And in 1992 we passed the Surface Transportation Act. As a result, I have little doubt that the system is now being improved.

At some point, with today's level of real investment, the system will have reached an optimum state of repair. Will spending be cut back immediately at that point? Probably not. It seems inevitable, once started, there is a strong tendency to overdo things. The more spending that is added in the interim, the harder it will be to avoid waste and inefficiency once the capital stock has reached an optimum level.

There is one generalization about public investment programs that I feel confident in making. They should never be used as part of a stimulus program. It simply takes too long to get them going and too long to get them completed. This was always true, but it is even more true in this day of complex regulations, such as those requiring environmental impact statements, and the "not-in-my-backyard" phenomenon.

You will hear from mayors, governors, and Federal agency heads that they have projects on the shelf ready to go except for lack of funding. When you try to get them off the shelf, you will find a much more arduous struggle than anticipated. That was certainly true of President Carter's Accelerated Public Works program that was still spending money many years after enactment.

If a new program were enacted tomorrow, I feel confident in predicting that far less than one-half of the appropriation will have been spent one year from now and that there will still be significant spending five years from now.

Another problem is that haste does make waste. Even if it is true some projects are ready to go, it would be a colossal accident for those projects to be the ones with the highest rates of return. Why waste scarce budget dollars on low rate of return projects? There are much more rapid ways of stimulating the economy, although it must be emphasized that none works with lightning speed. That makes me strongly believe that it is undesirable to engage in a stimulus program this far into an economic recovery, but that is not what I am testifying about today.

In conclusion, my main message is to be careful out there. Although I voiced the dangers of generalizations at the beginning of this testimony, it is my suspicion that the so-called infrastructure problem was much exaggerated from the beginning. But whatever the truth of that statement, it is certainly true that we have already done a lot about it with, for example, the real value of transportation spending on physical investment rising 58 percent between a trough in fiscal 1982 and fiscal 1993.

The key question is, "How much more is left to be done?" Careful analysis by the Congressional Budget Office suggests that the opportunity for additional high rate of return investments are fairly limited.

Thank you very much, Mr. Chairman.

Mr. CARR. Thank you very much for your thoughtful remarks. I think, for the convenience of the panel, unless somebody signals they have a plane to catch, what we will do is we will continue with all panel members and then ask questions.

[The biography and prepared statement of Dr. Penner follows:]

RUDOLPH G. PENNER

Rudolph G. Penner is Director of Economic Studies in the Policy Economics Group at KPMG Peat Marwick in Washington. Previously, he was a senior fellow at the Urban Institute and is former Director of the Congressional Budget Office. He was formerly a Director of Fiscal Policy Studies and Resident Scholar at the American Enterprise Institute for Public Policy Research. Earlier posts in government include Assistant Director for Economic Policy at the Office of Management and Budget, Deputy Assistant Secretary for Economic Affairs at the Department of Housing and Urban Development, and Senior Staff Economist at the Council of Economic Advisers. Before 1975, Dr. Penner was a professor of economics at the University of Rochester. He is a past President of the National Economists Club and in 1984 was elected a Fellow by the National Association of Business Economists (NABE). In 1989, he was elected to the Board of Directors of NABE and also, received the Abramson Prize for the best article published in 1988-89 in Business Economics.

Mr. Penner was born in 1936 and raised in Amherstburg, Ontario, Canada. His undergraduate degree is from the University of Toronto. His Ph.D is in Economics, from the Johns Hopkins University in Baltimore, Maryland. His most recent book, co-authored with Alan Abramson, is Broken Purse Strings, a study of the Congressional budget process. In addition, he recently edited The Great Fiscal Experiment, the proceedings of a conference on the macroeconomic effects of the budget deficits of the 1980s. Both books are published by The Urban Institute.

He is also the author of numerous books, pamphlets and articles on tax and spending policy, and has authored columns for various newspapers, among them the New York Times, Washington Post, and Los Angeles Times.

Mr. Penner lives in Washington, D.C., and his wife, Alice, is a psychiatric social worker. They have two sons, Eric and Brian.

TRANSPORTATION AND OTHER INFRASTRUCTURE INVESTMENT

STATEMENT OF

RUDOLPH G. PENNER
DIRECTOR OF ECONOMIC STUDIES
POLICY ECONOMICS GROUP
KPMG PEAT MARWICK

BEFORE THE
SUBCOMMITTEE ON TRANSPORTATION AND RELATED AGENCIES
OF THE
HOUSE OF REPRESENTATIVES COMMITTEE ON APPROPRIATIONS

FEBRUARY 4, 1993

The views expressed in this testimony are those of the author alone and do not necessarily reflect the views of the management or employees of KPMG Peat Marwick.

TRANSPORTATION AND OTHER INFRASTRUCTURE INVESTMENT

Rudolph G. Penner

Policy Economics Group

KPMG Peat Marwick

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STATEMENT OF DR. CHARLES HULTEN

Mr. CARR. Dr. Charles Hulten.

Dr. HULTEN. Thank you very much. It is a pleasure to be here today to discuss the issue of public infrastructure investment. Infrastructure has become an important part of the policymaker's vocabulary. Its meaning is often vague, but infrastructure has been invested by some with an almost magical power to revitalize the American economy. This mystique has helped generate strong support for a large increase in infrastructure spending.

This is, however, an era of fiscal stringency and there are many competing demands on the federal budget dollar. Any proposal for increased spending must therefore be evaluated not only on its own merits, but also in light of other uses of the budget dollar.

In other words, the question is not whether infrastructure investment is a good thing but whether it is such a good thing that it dominates all other claims on Federal dollars. So before rushing to decision on a massive new commitment, it is important to examine the case for infrastructure spending in detail.

This case rests on four separate legs. First of all, advocates of more spending point to a decline in constant public dollar investment over the past two decades. According to CBO estimates, capital spending by State and local governments as a share of Federal, State and local governments, as a share of GDP, averaged 1.8 percent in the 1960s and fell to an average of 1.5 percent during the 1970s and to 1.2 percent during the 1980s. This decline is seen as evidence for a massive underinvestment in public capital.

However, critics of this argument point out the decline in the share of GDP devoted to public capital formation cannot be taken as a priori as compelling evidence for inadequate spending. After all, the share of GDP originating in agriculture has declined over the decades, but nobody is talking about a food crisis in this country. Moreover, the period of comparison is deceptive. The peak spending period in the 1950s and 1960s was also a period in which the interstate highway system was built and schools were expanded to accommodate the baby boom.

After these programs wound down, it was natural that spending would decline as the country grew into its newly-enlarged capital stock. To accept peak spending as the norm is to commit the country to a continuous and endless program of building regardless of need or voter preferences.

The second pillar of the pro-infrastructure argument rests on evidence that pavement quality deteriorated during the 1970s and congestion increased during the 1980s. This evidence, combined with public perceptions of growing potholes and more unpleasant commutes, supports the thesis of inadequate spending. A recent study by the Federal Highway Administration estimates $46.2 billion was needed in 1992 just to keep highway and bridge performance at its 1991 level and only $36 billion was actually spent.

Congestion and poor road condition are indeed problems in many places, particularly urban areas and particularly those cities experiencing fiscal distress or rapid growth. However, these specific problems should not be taken as evidence for a crisis everywhere in the highway system.

In another study, the FHWA found that mean travel to work for a nation, as a whole, increased by only 40 seconds between 1980 and 1990. Furthermore, the condition of our highways and bridges should not be used to argue there is an underinvestment crisis in all types of public infrastructure, much of which is largely located, in many instances, in non-highway types of functions, such as, for example, communications and private utilities.

Moreover, the solution to the condition problem is not necessarily dramatic increases in spending. Few people are willing to spend the money needed to maintain their car or house in perfect working order and are equally unwilling to do so for public capital facilities. Where problems have become serious enough to justify a significant increase in capital expenditures, taxpayers are entitled to know why these problems were allowed to become so serious.

$571 billion were spent by all levels of government on highway capital between 1970 and 1989, and it is worth asking if this money might not have been better spent dealing with the problems that now compel us to consider the further need for spending. Is there any guarantee additional money will solve the problems that the past has failed to correct?

This is, of course, a complex issue, but part of the answer is surely that many of our highway problems are the result of self-inflicted wounds. In the early years of the Federal highway program, when the emphasis was on new construction, the matching grant system was designed to steer spending to new construction. This gave the States little incentive to spend available budget dollars on maintenance and repair. This situation has gradually been corrected but has left a legacy of undermaintained bridges and highways.

Others point to poor decisions about pavement thickness and also to the failure to price appropriately the wear and tear that trucks cause or heavy trucks cause on highways. They also note the failure to increase road costs during periods of peak utilization contributes to the congestion problem.

The evidence from the needs assessment studies is similarly ambiguous. These studies are based on the amount of investment needed to maintain or improve average vehicle performance over the highway system. And while the resulting estimates provide a framework for assessing the extent and location of spending needs, the FHWA also warns their "investment analysis results should not be represented as either the preferred or optimal investment strategies."

In other words, taxpayers may conclude they have more pressing needs for some of the $52 billion required to maintain the vehicle performance at past levels.

The third pillar of the case for more spending rests on macroeconomic studies that find a strong correlation between infrastructure and economic growth. The correlations imply a greater return to infrastructure investment that can only be described as staggering. Robert Reich, for example, noted these correlations imply a $10 billion increase in public capital would lead to a permanent increase in GDP of $7 billion.

A statistical correlation does exist at the macroeconomic level, and David Aschauer, Alicia Munnel, and other researchers should be commended for documenting it, but this correlation is fragile and the direction of causality is unclear. Other researchers have concluded it is not robust to reasonable changes in the forum of the statistical analysis. And, as with all correlations, there is the question of whether a slowdown in public investment caused slower economic growth or whether it was the other way around. There are good reasons to believe it was largely the latter. As growth slowed and the misery index rose during the 1970s, Americans felt poorer and voted limitations on public expenditures.

Finally, the idea that inadequate infrastructure spending is the source of America's competitiveness problems is extremely dubious. The great success of Japan's auto industry was not due to superior infrastructure capital. Japanese auto producers were successful because they pioneered new production techniques, like quality circles and the just-in-time inventory systems. And the decline of the U.S. steel industry was accelerated when the construction of one particular piece of infrastructure—the St. Lawrence Seaway—allowed iron ore to be shipped to Japan, made into steel, and then sold competitively on world markets.

Job creation is the last pillar of the case for more infrastructure spending. The recent recession, combined with the ongoing fiscal distress of many American cities, is seen by many as sufficient reasons to enact a public works program to put people back to work. However, the obvious problem with a short-run public works strategy early in 1993, is that we appear to be coming out of the recession.

Moreover, it is not at all clear that a stimulus package should include a large public works component because there is a real question about how ready to go the on-the-shelf projects really are. Public interest litigation, environmental and other certifications, and plain old NIMBY are a fact of modern life. And even if projects are "on-the-shelf," there is a lot more involved in taking them "off-the-shelf" than simply finding the requisite funding.

Another reason for caution is the "hangover" left by a short-run infrastructure spending binge. There is a danger that once infrastructure investment is seen as a short-run employment program, there will be inevitable pressure to find projects on which to spend money regardless of their long-term merit. The danger is heightened by the fact that some of our unemployment and growth problems are caused, in part, by structural changes in the global economy and to the low rate of net national saving. To the extent that unemployment is structural, a short-run employment program may well turn into a long-run program to provide jobs in economically distressed areas.

A closer look at the evidence thus reveals a much more uncertain picture about the desirability of additional infrastructure spending than is often presented. This is not to say infrastructure is irrelevant. There are times when infrastructure leads economic development, but there are also times when economic growth pulls infrastructure along, when further spending has little impact on output growth. Before we rush into a major new spending commitment, we had better be sure which situation is which.

This can be only done by examining how each infrastructure project contributes to economic growth and by rejecting the "pay now, fly later" approach, which commits substantial sums of money to a program without any clear idea of how the money is to be spent. Nebulous assertions about the overall value of infrastructure should not be used to justify a large new program of public works spending, nor should it be allowed to supplant a sound analysis of individual projects.

What does this mean for individual spending levels? This cannot be determined with any precision until new projects are actually proposed. But as a general rule, we should set funding levels for public infrastructure that are appropriate for the objective of meeting all of the future capital needs of the country, and not just the infrastructure capital needs. This means, in my view, that we must give a higher priority to reducing the Federal budget deficit than to infrastructure spending, and that the main effort in the infrastructure area should be to use the existing resources more efficiently.

The new transportation program introduced by the Surface Transportation Act of 1991 makes a start in the right direction by improving program design. It also provides for increase in funding levels of 30 to 50 percent. This is a lot of extra money. Before adding more to the pot, let's see what this buys us.

Thank you.

[The biography and prepared statement of Dr. Hulten follows:]

CHARLES REID HULTEN

Resume

Charles R. Hulten is Professor of Economics at the University of Maryland, where he has taught since 1985. He is also a Research Associate of the National Bureau of Economic Research (1985 and current) and Chairman of the Conference on Research in Income and Wealth (1985 and current). Before joining the University of Maryland, he was a Senior Research Associate at the Urban Institute (1978-1985) and Assistant Professor of Economics at Johns Hopkins University (1971-1978). He has also been a Visiting Professor of Economics at the European Institute of Business Administration (1992) and a Visiting Scholar at American Enterprise Institute (1988-1992). His undergraduate and Ph.D. degrees are from the University of California, Berkeley (1965 and 1973, respectively).

Hulten has combined a career of teaching and research in the areas of productivity analysis, economic growth and capital formation, and tax policy and the measurement of economic depreciation. He is the author of numerous articles in professional journals and has edited The Legacy of Reaganomics (with Isabel V. Sawhill) and A Comparison of Productivity in Japan and the United States. He currently serves on the Editorial Board of the journal, Economic Inquiry. He has also been the recipient of five National Science Foundation research grants, and has been a consultant to Office of Management and Budget (1981-82), U.S. Treasury, Office of Tax Analysis (1987-88), U.S. Agency for International Development (1990-1992), and the World Bank (1990-1992). He held an Intergovernmental Personnel Act appointment (part-time) at the Bureau of Labor Statistics, Division of Productivity Research (1983-84).

Hulten's interest in public policy includes testimony before the U.S. Congress, and publication of articles on policy issues. He has served on the Public Infrastructure Subcouncil of the Competitiveness Policy Council (1992).

He was born March 13, 1942, in Eugene, Oregon. He is married to Nancy P. Humphrey.

Infrastructure Spending: The Fountain of Youth For a Mature Econo

Charles R. Hulten

Professor of Economics
University of Maryland

Testimony Prepared for the February 4, 1993, Hearing of the
Committee on Appropriations
Subcommittee on Transportation and Related Agencies
U.S. House of Representatives

The term "infrastructure" has become an important part of the policy maker's vocabulary. Although it's meaning is often vague - sometimes it is synonymous with public sector capital, sometimes with transportation and public utility networks, sometimes something else - "infrastructure" has been invested with an almost magical power to revitalize the American economy. This mystique has helped generate strong support for a large increase in infrastructure spending, and Congress will undoubtedly be asked to consider new spending programs.

This is, however, an era of fiscal stringency and there are many competing demands on the federal budget. Any proposal for increased spending must be evaluated not only on its own merits, but also in light of the benefits that could be obtained from other uses of the budget dollar, like deficit reduction. Thus, the question is not whether infrastructure investment is a good thing, but whether it is such a good thing that it dominates other claims on the budget. So, before rushing to decision about a massive new commitment, it is important to examine the case for infrastructure in detail.

This case rests on four separate legs: the decline in real infrastructure spending over the last two and a half decades, the apparent deterioration and increased congestion of America's roads and bridges, statistical studies that show a strong correlation between infrastructure investment and economic growth, and the beneficial effect of public works projects in putting people back to work. Together, these legs seem to constitute a powerful case for more spending. But when the arguments are examined in individual detail, the case is seen to be far weaker.

Inadequate Investment

Advocates of more infrastructure spending point to a decline in constant dollar public investment over the past two decades. According to Congressional Budget Office estimates, capital spending by state and local government, expressed in 1990 dollars, rose more or less steadily throughout the 1950s and 1960s and peaked in 1972. A steep decline in real capital expenditure set in after 1972 and it was not until 1986 that the 1972 level was once again attained. And, as a share of GDP, infrastructure capital spending averaged 1.8 percent in the 1960s and then fell to an average of 1.5 percent during the 1970s and to 1.2 percent during the 1980s. This decline is seen as evidence of a massive under investment in public capital.

Critics of this argument point out that a decline in the share of GDP devoted to public capital formation cannot be taken a priori as compelling evidence for inadequate spending. The share of GDP originating in agriculture has declined over the decades, but no one is talking about a food crisis in this country. Moreover, the period of comparison is deceptive. The peak spending period of the 1950s and 1960s was also the period in which the Interstate Highway system was built and schools were expanded to accommodate the baby boom. After these programs wound down, it was natural that spending would decline as the country grew into its newly enlarged capital stock. To accept peak spending as the norm is to commit the country to a continuous and endless program of building, regardless of need or voter preferences. And, the voters made their preferences very clear, enacting expenditure limitation provisions in many states, and voting down infrastructure bond referenda (Peterson 1990, 1991). In recent years, not-in-my-back-yard community opposition, the high cost of urban land, and environmental legislation have made state-local capital investment more difficult.

A Deteriorating Infrastructure

The available evidence suggests that there was a deterioration in pavement quality during the 1970s and increased congestion during the 1980s. This evidence, combined with public perceptions of growing potholes and more unpleasant commutes, supports the thesis of inadequate public investment. A recent study by the Federal Highway Administration (FHWA) estimates that $46.2 billion was needed in 1992 just to keep highway and bridge performance at its 1991 level, and that only $35.9 billion was actually spent. The same study estimates that the cost to maintain 1991 performance and condition will average $51.6 billion per year over the next twenty years, and that the cost to improve system capacity by 40 percent and eliminate the backlog of highway deficiencies will average $67.3 billion.

Congestion and poor road condition are indeed problems in many places, particularly urban areas and particularly those cities experiencing fiscal distress or rapid growth. However, these specific problems should not be taken as evidence of a crisis everywhere in the highway system. In another recent study, the FHWA found that mean travel time to work for the nation as a whole hardly increased between 1980 and 1990 - from 21.7 to 22.4 minutes - but that some areas saw a more significant increase (for example, Los Angeles County commutes increased from 24 to about 27 minutes). Furthermore, the condition of our highways and bridges should not be used to argue that there is an under-investment crisis in all types of infrastructure, much of which is located in the communications and private utility sectors of the economy.

Moreover, the solution to the condition problem is not necessarily a dramatic increase in spending. Some deterioration and congestion are inevitable: few people are willing spend the money needed to maintain their car or house in perfect working order, and are equally unwilling to do so for public capital facilities. But, when your car does break down, you generally get it fixed. Since $571 billion (in 1990 prices) were spent by all levels of government on highway capital between 1970 and 1989, taxpayers are entitled to know why this money was not spent fixing those problems that now compel us to consider further spending. They might also wonder if additional money will fix the problems that past spending failed to correct.

This is a complex issue, but part of the answer is surely that many of our highway problems are the result of the way highway dollars were spent. In the early years of the federal highway program, when the emphasis was on new construction, the matching grant system was designed to steer spending to new construction (the matching rate was 90 percent for Interstate Highway construction and 75 percent rate for other federal-aid highway building). This gave the states little incentive to spend available budget dollars on maintenance and repair. This situation has been gradually corrected, but it has left a legacy of under maintained bridges and highways.

Small, Winston, and Evans (1989) also point to poor decisions about pavement thickness and the failure to price appropriately the the wear and tear that heavy trucks cause on highways. They also note that the failure to increase road costs during periods of peak utilization contributes to the congestion problem: after all, things that are provided free of charge are likely to be in excess demand.

The deferred maintenance policies of many fiscally strapped cities was another source of self-inflicted wounds. But, as Heywood Sanders has remarked, cities which plead poverty when it comes to maintaining or expanding basic infrastructure facilities like roads are often willing and able to find money to build another type of urban infrastructure -- sports arenas and stadiums.

The evidence from the needs assessment studies is similarly ambiguous. These studies are based on the amount of investment needed to maintain or improve average vehicle performance over the highway system, and while the resulting estimates provide a framework for assessing the extent and location of possible spending needs, the FHWA also warns that "The investment analysis results should not be represented as either preferred or optimal investment strategies. They are benchmarks to support further policy and budget analysis (FHWA (1993), page 175)." In other words, taxpayers may conclude that they have more pressing needs for some of the $51.6 billion needed to maintain vehicle performance at past levels.

An even more important objection with any needs estimates lies with the inherent difficulty in forecasting future developments in technology or policy. During the 19th century, many investments in canals went bankrupt as canals gave way to railroads. Railroads have, in turn, lost ground to trucks, and it is quite possible that the importance of current modes of transportation will diminish as the telecommunication revolution proceeds.

Infrastructure and Economic Growth

Macroeconomic studies that find a strong correlation between infrastructure and economic growth, like those by David Aschauer and others, have become one of the strongest pillars of the case for increased infrastructure spending. These studies imply a rate of return to infrastructure investment that can only be described as staggering. Robert Reich, for example, writing in the February 1991 issue of the Atlantic magazine, has noted that this correlation implies that a $10 billion increase in public capital would lead to a permanent increase in GDP of $7 billion. The same macroeconomic studies also link the decline in spending to slower economic growth in the U.S., and some have argued that inadequate infrastructure is a source of the decline in America's competitiveness in international trade.

A statistical correlation does exist at the macroeconomic level, and David Aschauer, Alicia Munnell and other researchers should be commended for documenting it. But this correlation is fragile and the direction of causality is unclear. Other researchers (e.g., Holtz-Eakin (1992), Hulten and Schwab (1991, 1993), Jorgenson (1991), Tatom (1991)) have concluded that it is not robust to reasonable changes in the form of the statistical analysis. The relation between infrastructure and growth is, for example, much weaker when year-to-year changes are considered.

And, as with all correlations, there is the question of whether a slowdown in public investment caused slower economic growth, or whether it was the other way around? There are good reasons to believe that it was largely the latter. As growth slowed and the misery index rose during the 1970s, Americans felt poorer and voted for limitations on public expenditures and voted down public bond referenda. These limitations extended to infrastructure spending, which, after all, had been particularly strong in the preceding decades as a result of the Interstate Highway and school construction programs.

Finally, the idea that inadequate infrastructure spending is the source of America's competitiveness problems is extremely dubious. The great success of Japan's auto industry was not due to superior infrastructure capital. Nor were Detroit's problems due to a deteriorating American infrastructure. The infrastructure in Japan is, in fact, no better than in the U.S., and is probably worse. Japanese auto producers were successful because they pioneered new production techniques, like quality circles and the just-in-time inventory system. And, the decline in the U.S. steel industry was accelerated when the construction of one piece of infrastructure, the St. Lawrence Seaway,allowed iron ore to be shipped to Japan, made into steel, and sold competitively on world markets.

Infrastructure and Job Creation

Job creation is the last pillar of the case for more infrastructure spending. The recent recession, combined with the on-going fiscal distress of many American cities, is seen by many as sufficient reason to enact a public works program to put people back to work. The fact that this program will have additional long-run benefits is so much the better. A February 11, 1992, document produced by the United States Conference of Mayors estimated that there were 4543 projects in 305 cities, with a 1992 price tag of $8.6 billion and a multiyear cost of $18.2 billion, that were "ready to go." Other estimates suggest a similarly large or larger backlog of projects "on the shelf."

The obvious problem with a short-run public works strategy in early 1993 is that we appear to be coming out of the recession. To enact a program of short-run economic stimulus during a recovery runs the risk of over-heating the economy during later stages of the expansion. But, even if Congress and the Administration decide that a short-run stimulus is needed, it is not at all clear that a stimulus package should include a large public works component. One reason is that there is a question about how "ready to go" the "on the shelf" projects really are. Public interest litigation, environmental and other certifications, and plain old NIMBY are a fact of modern life, and even if projects are "on the shelf," there is a lot more involved in taking them "off the shelf" than simply finding the requisite funding.

Another reason for caution is the "hangover" left by a short-run infrastructure spending binge. There is a danger that once infrastructure investment is seen as a short-run employment program, there will be inevitable pressure to find projects on which to spend money regardless of their long-run merit (one observer has remarked that "you can always put people to work painting streets black"). The danger is heightened by the fact that many of our employment and growth problems are caused, in part, by structural changes in the global economy and to the low rate of net national saving. To the extent that unemployment is structural, a short-run employment program may well turn into a long-run program to provide jobs in economically depressed areas.

Conclusion

A closer look at the evidence thus reveals a much more uncertain picture about the need for additional infrastructure spending than is often presented. This is not to say that infrastructure is irrelevant. It is impossible to imagine a modern economy that could function without roads or airports, without electricity or telecommunications, or without water and sewer systems. I doubt any economist would argue that infrastructure is irrelevant for private productivity. Most economists would, indeed, accept the idea that there are times when infrastructure leads economic development. The intercontinental railroads and the Interstate Highway System are examples of the strategic importance of infrastructure in the development of the American economy, and high technology telecommunication networks may play a strategic role in the future. But there are also times when economic growth pulls infrastructure along, when further spending has little impact on output growth. Before we rush into a major new spending commitment, we had better be sure which situation is which, and which technology we want to back.

This can only be done by examining how each new infrastructure project contributes to economic growth and by rejecting the "pay now, fly later" approach which commits substantial sums of money to programs without any clear idea of how the money is to be spent. Nebulous assertions about the overall value of infrastructure should not be used to justify a large new program of public works spending, nor should it be allowed to supplant a sound analysis of individual projects. Moreover, the analysis of infrastructure projects should incorporate other national priorities, like reducing air pollution, and we had better be sure that any new program does not repeat the many self-inflicted wounds that have led to wasted public dollars in the past.

What does this mean for actual spending levels? This cannot be determined with any precision until new projects are actually proposed. But as a general rule, we should set funding levels for public infrastructure that are appropriate for the objective of meeting all of the future capital needs of the country, and not just infrastructure capital. This means, in my view, that we must give a higher priority to reducing the federal budget deficit than to new infrastructure spending, and that the main effort in the infrastructure area should be to use existing resource more efficiently. This means superior facility management, including maintenance, better facility design, including more durable pavement on roads, and more efficient rationing of facilities, through congestion fees and tolls. Superior design of the federal matching grant programs is also an important feature of an efficient solution.

The new transportation program introduced by the Intermodal Surface Transportation Efficiency Act of 1991 makes a start in the right direction by improving program design. It also provides for an increase in funding levels of 30 to 50 percent. This is a lot of extra money. Before adding more to the pot, let's see what this buys us.

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Mr. CARR. Thank you very much, Dr. Hulten. Your suggestions are very thought provoking. I understand you and Dr. Schwab work in tandem. You know one another; is that correct?

Dr. HULTEN. We have met.

STATEMENT OF DR. ROBERT M. SCHWAB

Mr. CARR. Dr. Schwab.

Dr. SCHWAB. I want to thank the Chairman and the rest of the Committee for the opportunity to be here today and I would like to focus on two important issues in the infrastructure debate.

First, lower infrastructure spending in the past was the key reason the economy performed so poorly during the last two decades, and, second, additional spending in the future will allow us to grow much faster and become more competitive in international markets. I disagree strongly with both points.

A wide range of studies have looked at the relationship between economic performance and public investment in the past. The focus of these studies has either been on the aggregate U.S. economy over time, regional growth, or international comparisons. The evidence from all three types of studies is not very convincing.

Most economists are unwilling to put much faith in the results from aggregate time series studies. The time series data are dominated by two events, infrastructure investment, say as a proportion of gross domestic product, fell sharply in the late 1960s and early 1970s, and the U.S. economy has performed poorly since 1974 by almost any standard. Given these trends, it is not surprising that time series studies often find that public investment and economic performance are closely linked. But while it is clear the two are associated, it is far from clear that lower infrastructure investment was the cause of slower growth.

Anything that fell during the 1960s and early 1970s is an equally plausible candidate for the cause of our problems. Average SAT scores, for example, fell from 980 in 1963 to 899 in 1977, and remain roughly constant since then. Wouldn't it be just as sensible to attribute the productivity slowdown to an identification gap as to an infrastructure gap?

Perhaps the following story will make this point clear. An economist once found an increase in the number of storks in a region was closely correlated with the number of babies born in that region. If we were to follow the logic of those who have argued in favor of additional spending on infrastructure, we might conclude this constitutes evidence that storks bring babies. The truth, however, not surprisingly, is that when the harvest was good, families were more likely to have a child and more storks came to the region to take advantage of the available food.

Of course, it is always easy to dismiss any evidence by arguing the correlation does not imply causality, but in this case there are enough other troubling pieces of evidence to suggest that we truly are dealing with spurious correlation. For example, if infrastructure were an important part of the productivity problem, then we would expect to find a significant slowdown in those sectors of the economy, such as manufacturing, that are quite dependent on infrastructure, but little change in other industries, such as services, finance, insurance and real estate. But the exact opposite is true. The productivity slowdown in manufacturing has been quite mild compared to the slowdown in the economy as a whole.

Moreover, it turns out that the time series evidence on this point is very fragile. Charles Hulten and I have found, for example, with slightly different statistical approaches, the same data could lead us to conclude additional investment in infrastructure could have a dramatic favorable impact on the private economy or virtually no impact at all.

As to regional growth, I would argue there is no evidence that infrastructure investment is an important determinant of regional economic performance. Charles Hulten and I have looked closely at the manufacturing sector in different regions of the country. It is well known infrastructure investment has been significantly higher in the newer Sun Belt regions as compared to the older Rust Belt. But, in fact, productivity growth in the Northeast and Midwest was somewhat faster in the south than the west. And this was no fluke if we simply look at a small period. We find the same trends throughout the post-World War II area.

The evidence from international research is also very weak. A recent study in the leading journal on economics looked at this question quite closely. It concluded the results from virtually all international studies are fragile and, particularly, it found little evidence that public investment is an important determinant of growth.

The second issue of concern in the debate over greater spending on infrastructure focuses on the wisdom of extrapolating the experience of the past into the future. As dubious as I am about the evidence of what happened in the past, I am even more dubious about its implications for the future. Suppose past infrastructure investment has generated significant benefits. What would this tell us about what we should do in the future? I would argue, for at least three reasons, the answer probably is not very much.

First, studies have looked prospectively at the returns that might be available from specific future investments. The Congressional Budget Office surveyed these cost benefit studies in 1988 and concluded the return on some investments was quite high, but, in general, quite a bit below the returns available on private investment.

Advocates of new spending have tried to dismiss the results of cost benefit studies, claiming that they miss many of the important benefits of investments. But clearly these studies can capture the issues that most concern us: The dangers from bridge disasters, the cost of congestion, and so on. The other benefits from infrastructure are ephemeral, and until someone can document these other benefits, they offer little justification for further spending.

Second, infrastructure investment is almost always subject to "decreasing returns"; that is, while initial investments might offer significant benefits, the returns to subsequent investments are much smaller, the returns to a third round smaller still, and so on. Thus, even if we knew with certainty the first investment was a good idea, we would still not know if the second was a good idea.

Let me offer an example to make this point more concrete. I do not doubt that the construction of the interstate highway system was an excellent idea and that the benefits from the system far outweighed the cost, but would anyone suggest we should build a second interstate system based on the success of the first?

Third, changes in the structure of the economy have substantially reduced the importance of transportation. Over time, the focus of economic activities has shifted away from the production of goods and toward the production of services and information. In 1959, when the interstate highway system was still in its infancy, the service sector represented a third of the entire economy; today that figure is over one-half. Given these changes, it would not be at all surprising that we should spend much less on transportation than we did before. The crucial issue today is our ability to move bits and bytes rather than cars and trucks.

I am also concerned that increased spending on infrastructure is inconsistent with other policy objectives. In particular, further infrastructure investment is likely to exacerbate environmental problems, particularly air quality, and might well cause serious damage to central cities. New roads will encourage more people to drive their cars to work and to abandon public transportation. Some have argued the effect on air quality from an increase in travel will be more than offset by the reduction in congestion. This is inconsistent with most of the available evidence.

The interstate highway system has done more harm to central systems than virtually any factor of which I am aware. It has encouraged firms and households, particularly upper income households, to forsake central cities in favor of the suburbs and once rural areas. I certainly would not advocate including the destruction of our highway system as part of our urban policy, but unless new infrastructure spending were very carefully targeted, the task of rescuing central cities could become even more difficult.

All of this is not to say our infrastructure policy is now ideal and that we need not give this problem any further thought. It is true that during the 1970s, we did allow spending to dip significantly below past levels and programs much lower than was wise. As a consequence, it is true the transportation system, as measured by congestion and surface conditions, did suffer. To some extent, policies recognize this issue.

Infrastructure investment in constant 1990 dollars has risen 2.4 percent per year from $46.8 billion in 1979 to 63.3 billion in 1989. The Intermodal Surface Transportation Efficiency Act of 1991 anticipates Federal expenditures of more than $155 billion over the next five years. But more can be done, and I suggest that we consider an infrastructure policy that includes two elements.

First, we should significantly expand cost benefit studies of proposed transportation investments. We should continue to invest in public capital until a dollar invested in the public sector returns the same to society as the dollar invested in the private sector. We do not want to miss public projects that will yield benefits to society that will exceed their cost. I recognize such studies have their limits, but I also recognize the technical skills and good judgment of the Congressional Budget Office and others and I believe they will be able to offer guidance on which projects we should fund.

Second, we need to focus much more heavily on the efficient use of infrastructure. Currently the price of using most roads is zero. And at a price of zero, the demands for any good will almost always greatly exceed the supply. We should instead set the price of using roads and other public capital equal to the cost users impose on society, including the cost of increased congestion. The technology is now available to collect these user fees relatively inexpensively and with a minimum of convenience.

Let me conclude: I know I am not the first person to argue against substantially increasing infrastructure investment. Some have done so out of their sense that government can do nothing right. I am starting from a very different point. I believe that government faces enormous responsibilities that it must meet. Millions are without health insurance, our education system shows little sign of improvement, central cities continue to suffer, real wages are lower now than they were a decade ago, unemployment remains high, we struggle to compete in many international markets, and government must meet these challenges and still find a way to significantly reduce the $300 billion deficit.

We should not spend more on infrastructure because infrastructure is neither the cause nor the solution of the problems I have mentioned. Government should reserve the funds available to it to solve real problems, not ones that are imagined.

[The biography and prepared statement of Dr. Schwab follow:]

Robert M. Schwab

Robert M. Schwab received his BA from Grinnell College in 1969 and a masters degree in city and regional planning from the University of North Carolina in 1971. He then worked as a planner and real estate analyst for Gladstone Associates, the Rouse Company and the Inland Steel Company until 1976 when he began work on a PhD in economics at Johns Hopkins University. In his doctoral work, Schwab specialized in urban and public economics. He received his degree in 1980 and joined the economics department at the University of Maryland. He is now a professor of economics and director of graduate studies.

Schwab's research has focused on a range of issues in urban, regional, and public economics. His ongoing work with Charles Hulten on regional differences in productivity growth and the effects of infrastructure investment on regional productivity has been supported by a grant from the National Science Foundation. He is also currently engaged in research on the lifetime incidence of tobacco and alcohol taxes, the effectiveness of private schools, and the economic consequences of land value taxation. His work has been published in many economics journals including the Journal of Political Economy, the American Economic Review, and the Journal of Public Economics. His research has been supported by two grants from the National Science Foundation, the Sloan Foundation, and the Lincoln Institute of Land Policy. Schwab has served as a consultant to a number of organizations including the World Bank, the Urban Institute, and Resources for the Future. He has received two teaching awards from the College of Behavioral and Social Sciences at the University of Maryland and many department teaching awards.

Federal Infrastructure Policy

Robert M. Schwab

Department of Economics
University of Maryland

U.S. House of Representatives
Committee on Appropriations
Subcommittee on Transportation and Related Agencies

February 4, 1993

Some people would encourage the government to try to solve many of our economic problems by substantially increasing our investment in infrastructure. I want to argue that this is poor advice, and to urge you to move very slowly and cautiously on this question.

I would like to focus on two important issues in the infrastructure debate: (i) lower infrastructure spending in the past was a key reason the economy performed so poorly during the last two decades, and (ii) additional spending in the future will allow us to grow much faster and to become more competitive in international markets. I disagree strongly with both points.

A wide range of studies have looked at the relationship between economic performance and public investment in the past. The focus of these studies has either been on the aggregate U.S. economy over time (why did the U.S. grow so much faster prior to 1974 than after?), regions (why did the Sun Belt grow faster than the Rust Belt), and international comparisons (why has the Japanese economy performed so much better than the U.S. economy?).

The evidence from all three types of studies is not very convincing. Most economists are unwilling to put much faith in the results from aggregate time series studies. The time series data are dominated by two events; infrastructure investment (as say a proportion of GDP) fell sharply starting in the late 1960's and early 1970's, and the U.S. economy has performed poorly since roughly 1973 by almost any standard. Given these trends, it is not surprising that time series studies often find that public investment and economic performance are closely linked. But while it is clear that the two are associated, it is far from clear that lower infrastructure investment was the cause of slower growth. Any variable that fell through the 1960's and early 1970's is an equally plausible candidate for the cause of our problems.

Average SAT scores, for example, fell from 980 in 1963 to 899 in 1977 and have remained roughly constant since then. Would it not be just as sensible to attribute the productivity slowdown to an "education gap" as to an "infrastructure gap"?

Perhaps the following story will make this point clear. An economist once found that an increase in the number of storks in a region was closely correlated with the number of babies that were born in that region. If we were to follow the logic of those who have argued in favor of additional spending on infrastructure, we might conclude that this constitutes evidence that storks bring babies. The truth, however, is that when the harvest was good, families were more likely to have another child, and more storks came to the region to take advantage of the available food.

Of course, it is always easy to dismiss any evidence by arguing that correlation does not imply causality. But in this case there are enough other troubling pieces of evidence to suggest that we truly are dealing with spurious correlation. For example, if infrastructure were an important part of the productivity problem, then we would expect to find a significant slowdown in industries such as manufacturing that are very dependent on infrastructure, but little change in other industries such as services and finance, insurance, and real estate. But in fact the exact opposite is true; the productivity slowdown in manufacturing has been very mild. The growth rate of GDP per hour of work in manufacturing was roughly the same in the 1973-87 period as it was during 1948-73. In contrast, in the private sector as a whole, GDP per hour grew at a rate only about one-third of the pre-1973 rate.

Moreover, it turns out that the time series evidence on this point is very fragile. Charles Hulten and I have found, for example, that with slightly different statistical approaches, the same data could lead us to conclude that additional investment in infrastructure could have a dramatic impact on the private economy or virtually no impact.

As to regional growth, I would argue that there is no evidence that infrastructure investment is an important determinant of regional economic performance. Charles Hulten and I have looked closely at the manufacturing sector in different regions of the country. It is well known that infrastructure investment has been significantly higher in the newer Sun Belt regions as compared to the older Rust Belt. For example, during the 1978-1986 period the stock of infrastructure essentially did not grow at all in the northeast and midwest, but grew at an annual rate of about 1.6 percent in the south and west. But in fact, productivity growth in the northeast and midwest was somewhat faster than in the south and west. And this period was no fluke. We found that throughout the post war period, productivity growth was roughly the same in all regions; to the extent that we did find differences, in general productivity grew slightly faster in the Rust Belt. Douglas Holtz-Eakin of Syracuse and Robert Eisner of Northwestern have reached similar conclusions in their work.

The evidence from international research is also very weak. A recent study in the leading journal in economics looked at this question quite closely. It concluded that the results from virtually all international studies are very fragile. In particular, it found little evidence that public investment is an important determinant of growth.

The second issue of concern in the debate over greater spending on infrastructure focuses on the wisdom of extrapolating the experience of the past into the future. As dubious as I am about the evidence of what happened in the past, I am even more dubious about its implications for the future. Suppose for the moment that I have interpreted the evidence incorrectly and that in fact past infrastructure investment has generated significant benefits. What would this tell us about what we should do in the future? I would argue that, for at least three reasons, the answer probably is: not very much.

First, studies have looked prospectively at the returns that might be available from specific future investments. The Congressional Budget Office surveyed these cost benefit studies in 1988, and concluded that the return on some investments was quite indeed high. For example, the rate of return on expenditures to maintain highway surface conditions was favorable. But in general, the return on investments on new roads outside the most congested urban areas and investments to bring roads above minimum standards was typically very low.

Advocates of new spending have tried to dismiss the results of cost benefit studies, claiming that they miss many of the important benefits of investments. But clearly these studies can capture the issues that most concern us: the dangers from bridge disasters, the costs of congestion, and so on. The other benefits from infrastructure are somewhat ephemeral. Until someone can document other benefits, they offer little justification for further spending.

Second, infrastructure investment is almost always subject to "decreasing returns", i.e., while initial investments might offer significant benefits the returns to subsequent investments are much smaller, the returns to a third round smaller still, and so on. Thus even if we knew with certainty that the first investment was a good idea, we would still not know if the second would be worthwhile. Let me offer an example to make this point more concrete. I do not doubt that the construction of the interstate highway was an excellent idea, and that the benefits from the system outweighed the costs. But would anyone suggest that we should build a second interstate system based on the success of the first? The first linked the country economically and socially; it is not at all clear what we would gain from a second. While this point might seem obvious, it has often been missed. Advocates of further infrastructure spending often point to the success of the Erie Canal; what they sometimes fail to mention is that nearly all canals that followed went bankrupt.

Third, changes in the structure of the economy have substantially reduced the importance of transportation. Over time, the focus of economic activity has shifted away from the production of goods toward the production of services and information. Consider the following piece of evidence. In 1959 when the interstate highway program was still in its infancy, the service sector represented roughly one-third of the entire economy; today, that figure is over one-half. Given these changes, it would not be at all surprising that we "should" spend much less on transportation (as a proportion of total economic activity) than we did before; the crucial issue today is our ability to move bits and bytes, rather than cars and trucks.

I am also concerned that increased spending on infrastructure is inconsistent with other policy objectives. In particular, further infrastructure investment is likely to exacerbate environmental problems (particularly air quality), and might well cause serious damage to central cities. New roads will encourage more people to drive their cars to work and to abandon public transportation. Some have argued that the effect on air quality from an increase in travel will be more than offset by the reduction in congestion. This is inconsistent with most of the available evidence; I know of no environmental group that has argued that we could improve air quality by building new roads. The interstate highway system has done more harm to central cities than virtually any factor of which I am aware. It has encouraged firms and households -- particularly upper income households -- to forsake central cities in favor of the suburbs and once rural areas. I certainly would not advocate including the destruction of our highway system as part of our urban policy, but unless new infrastructure spending were very carefully targeted the task of rescuing central cities could become even more difficult.

All of this is not to say that our infrastructure policy is now ideal and that we need not give this problem any further thought. It is true that during the 1970's we did spend allow spending to dip significantly below past levels, and perhaps much lower than was wise; as a consequence, it is true that the transportation system as measured by congestion and surface conditions did suffer. To some extent policy has recognized this issue. Infrastructure investment (in constant 1990 dollars) has risen an average of 2.4 percent per year from $46.8 billion in 1979 to $63.3 billion in 1989; the Intermodal Surface Transportation Efficiency Act of 1991 anticipates federal expenditures of more than $150 billion over five years. But more can be done, and I suggest that we consider an infrastructure policy that includes two elements.

First, we should significantly expand cost benefit studies of proposed transportation investments. We should continue to invest in public capital until a dollar invested in the public sector yields the same return to society as a dollar invested in the private sector; we do not want to miss public projects that will yield benefits to society that exceed their cost. I recognize that such studies have their limitations. But I also recognize the technical skills and good judgment of the Congressional Budget Office and others, and I believe that they will be able to offer us guidance on which projects we should fund.

Second, we need to focus much more heavily on the efficient use of infrastructure. Currently, the price of using most roads is zero. At a price of zero, the demand for any good will almost always greatly exceed supply. Thus if we were (for some reason) to charge nothing for food, the result would almost certainly be chronic food shortages, just as we now always seem to have chronic infrastructure shortages. We should instead set the price of using roads and other public capital equal to the costs that users impose on society, particularly the cost of increased congestion. The technology is now available to collect these user fees relatively inexpensively and with a minimum of inconvenience.

I know that I am not the first person to argue against substantially increasing infrastructure investment. Some have done so out of their sense that government can do nothing right. I am starting from a very different point. I believe that government faces enormous responsibilities that it must meet -- millions are without health insurance, our education system shows little sign of improvement, central cities continue to suffer, real wages are lower now than they were a decade ago and unemployment remains high, we struggle to compete in many international markets. And government must meet these challenges and still find a way to significantly reduce a $300 billion deficit. We should not spend more on infrastructure because infrastructure is neither the cause nor the solution to any of the problems I have mentioned. Government should reserve the funds available to it to solve real problems, not ones that are imagined.

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Mr. CARR. Thank you very much. Apparently, we can adjourn for the year. It would please me to do that. But you offer some thought-provoking statements and I look forward to asking you some questions about that.

But before I do, I want to introduce Harvey Bernstein, President of the Civil Engineering Research Foundation.

STATEMENT OF MR. HARVEY BERNSTEIN

Mr. BERNSTEIN. Thank you, Mr. Chairman. I appear before you today in my capacity as president of the Civil Engineering Research Foundation, which is known as CERF, the research affiliate of the American Society of Civil Engineers, known as ASCE.

As you may know, ASCE is the oldest national engineering society in the United States, and today numbers over 110,000 members. CERF's mission is to serve as an industry-guided and directed research organization to enhance the quality, timeliness, and effective delivery of essential research for the design and construction industry. The foundation was established to facilitate, coordinate, and integrate research in our industry for our industry.

In 1991, CERF conducted a national research needs forum which involved over 300 leaders from government, industry and academia. Subsequently, CERF published a report entitled Setting a National Research Agenda for the civil engineering profession, which I have submitted to you with this testimony. What is unique about this report is that it is a nonpartisan identification of national research needs dealing with infrastructure done in 1991.

As your subcommittee begins to formulate transportation and infrastructure-related funding that can form the basis for an economic stimulus bill, I would like to suggest that you consider the national needs and potential solutions identified by this nonpartisan group. Although short-term actions or responses may be needed to stimulate the economy, CERF believes the most important path to fundamental change is a long-term focus on actions which will provide a strategic investments in our Nation's future.

CERF's approach to stimulating our economy may be somewhat different, in fact, perhaps radically from what you have just heard and what you may hear later on this morning. We believe investments in infrastructure-related innovation which are ready to be commercialized and introduced into the marketplace is the best solution to our economic crisis. This will not only lead to a revitalized national infrastructure, but also to the creation of new U.S. products and services, new U.S. businesses, and more jobs for the U.S. work force, resulting in an improved U.S. competitive position.

To better understand this approach to economic recovery through an increased investment in transportation and infrastructure innovation, let me give you a few facts: The construction industry, which represents almost 9 percent of our Nation's Gross Domestic Product, has traditionally been an important means of introducing people into the work force. As this industry lags behind other sectors in innovation, productivity growth, and competitiveness, it employs less people.

Meeting tomorrow's challenges with even today's technology will not work. We cannot compete in the 21st Century with the 20th

Century infrastructure system. Federal involvement in infrastructure-related R&D is already substantial, exceeding $1.2 billion in 1992, as CERF has documented in a recent study. While substantial, it remains a relatively small percentage of the overall Federal R&D investment of approximately $76 billion for 1992. Infrastructure transportation systems accounted for the largest portion of this investment at approximately $429 million.

According to an October 1989 report by the American Association of State Highway and Transportation Officials, the States annually spend about $147 million on highway-related and research development. However, highway research as a share of total highway program expenditures was about 0.2 percent, far less than most low-tech industries.

What is not clear at this time is how much of this Federal and State R&D effort is directly applicable to the transportation needs and opportunities that exist in States, cities and local municipalities. It is time to make this determination and to expedite the transfer of appropriate technologies into practice.

The emergence of the United States as a world leader in the 20th Century reflects in no small measure the influence of an outstanding infrastructure built on the innovative technologies introduced at the turn of the century. Those technologies, however, did not simply appear in some magical fashion. They were the result of a climate which encouraged and rewarded innovation.

Our foreign competitors seem to understand the value of infrastructure investment better than we do as they invest heavily in infrastructure and work to put in place state-of-the-art infrastructure systems; systems that promise to position them as even more formidable economic competitors in the 21st Century.

A recent article in the Chicago Tribune utilizing CERF's report entitled "Transferring Research Into Practice: Lessons from Japan's Construction Industry," put our Nation's competitive dilemma in perspective when it drew a parallel between the U.S. auto industry in 1972 and the construction industry of today. Japan's early emphasis on new innovative technologies and manufacturing processes for their auto industry have resulted in the Japanese now controlling 30 percent of the U.S. auto market. The U.S. cannot afford to let the same thing happen to the design and construction industry.

What we need to recognize as a nation is that the benefits of innovation transcend new technologies by themselves. Innovation often leads to less expensive options, thus providing our decisionmakers with the opportunity to obtain desired facilities at less cost, or additional infrastructure for a given level of expenditure, leading to more jobs and new markets.

To truly become innovative, we must remove what is a national millstone around our collective necks; namely, the specter of liability and risk. Presently, innovation is stifled and necessary R&D postponed because the risks overwhelm potential benefits. Even the largest design and construction firms in this country, acting with complete responsibility and social awareness are often unable to face the financial consequences of potential litigation.

Unless we collectively solve this truly national need through risk sharing, federally-backed demonstration programs, and public education, we cannot succeed in fostering innovation or putting into place the infrastructure that is truly needed. The bottom line is clear: Infrastructure revitalization and innovation depend upon minimizing risk and liability while maintaining adequate social and professional responsibilities.

Let me now suggest to you that a vital and proper response to resolving these needs are national cooperative programs. The scope of the problems and needs we face are far beyond the capabilities of the private sector alone, the government alone or academia alone. Cooperation by all interested parties is essential to maximizing the benefits from new innovation.

I would now like to briefly describe two potential national solutions: The first is a national program on high performance construction materials. For the most part, we are using construction materials on our highways and bridges that have changed little since the 19th century. For the past two years CERF has coordinated an industry-driven planning committee involving experts from both the public and private sectors. The result is a proposed national program entitled High Performance Construction Materials, an essential program for America and its infrastructure.

The program envisions a 10-year, $2 to $4 billion R&D effort encompassing traditional and emerging construction materials with an initial focus on concrete and steel. Federal funding, in addition to current R&D activities is estimated at $40 million a year for concrete and steel. Estimates of federal research funding requirements for other construction materials, such as composites, aluminum, masonry, timber, asphalts and protective coatings are still being refined but are in the range of $160 million per year.

Industry's support, direct and in-kind, will complement federal funding. The private sector is anxious to do its part through cooperative programs. The plan for this national program will be published and available in the near future and will be submitted to the President and Congress for consideration.

Let me now briefly describe the second national cooperative program which focuses entirely on highway transportation issues. It is known as the Highway Innovative Technology Evaluation Center, called HITEC. Under a multi-year cooperative agreement with the Federal Highway Administration, and in close coordination with many facets of the highway and civil engineering community, CERF is in the process of establishing HITEC, a nationally recognized service center and clearinghouse for implementing highway innovation.

Congressman Norm Mineta endorsed this concept when he said, and I quote, "The challenge is fusing together the innovations we need to build a new world of tomorrow, a world in which well-built highways link up easily with transit, and transit links up with airports, and airports link up with freightways." Efforts like CERF's HITEC will make that possible.

HITEC will serve as a focal point for evaluating new products, materials and processes and help to expedite these into practice by providing impartial evaluations of technologies where no industry standards exist. It is hoped that HITEC will enhance the incentives for the freight industry to invest in and for State and local governments to implement the innovative products out into the highway system.

Through a consensus-based approach and pooled funding mechanisms, the traditional risks of introducing new products will be shared more equitably, thus, encouraging more investment in both researching new ideas and introducing new products.

Continued funding under programs such as Section 6005 of the recently enacted Intermodal Surface Transportation Efficiency Act will be an important element of HITEC's success by providing matching federal funds to evaluate and demonstrate new innovative highway technologies.

I urge you to support national cooperative programs by providing direction and incentives that encourage application of innovative products and services on any funding utilized to rebuild our infrastructure. This should lead to new market opportunities, new U.S. products and services, new businesses and, therefore, more jobs for the U.S. work force.

Mr. Chairman, the Civil Engineering Research Foundation greatly appreciates being given the opportunity to present the views and convictions of the civil engineering professionals on whom this nation must depend to make our 21st Century infrastructure a reality.

I hope my comments and the additional information I have provided the subcommittee will be helpful. This concludes my remarks and I would be pleased to respond to any questions you may have.

[The prepared statement of Mr. Bernstein and a list of attachments that will be placed in the Subcommittee's files follow:]

TESTIMONY OF

Harvey M. Bernstein

President

CIVIL ENGINEERING RESEARCH FOUNDATION (CERF)

[Affiliated with the American Society of Civil Engineers (ASCE)]

before the

SUBCOMMITTEE ON TRANSPORTATION AND RELATED AGENCIES

COMMITTEE ON APPROPRIATIONS

U.S. House of Representatives

February 4, 1993

INTRODUCTION

Mr. Chairman and Members of the Subcommittee, my name is Harvey M. Bernstein, and I appear before you today in my capacity as President of the Civil Engineering Research Foundation (CERF), the research affiliate of the American Society of Civil Engineers (ASCE). As you may know, ASCE is the oldest national engineering society in the United States, and today numbers over 110,000 members. Entirely dedicated to applied research in the design and construction industry, CERF's mission is to serve as an industry-guided and directed research organization to enhance the quality, timeliness, and effective delivery of essential research, while ensuring coordinated efforts and activities among institutions with similar agendas. In essence, CERF is the only organization established to **"facilitate, coordinate and integrate"** research in our industry, for our industry, which represents nearly 9% of our nation's gross domestic product. CERF concentrates on minimizing duplication of research efforts and leveraging limited research funds to perform large scale cooperative R&D.

To achieve this, the Foundation serves as the design and construction industry's research link with government and academia; and equally vital, CERF focuses on significant national civil engineering research and development (R&D) challenges. These challenges are deeply embedded in the concerns that bring your Subcommittee together today. I am proud to say that CERF has, in its short history, succeeded in bringing government and corporate leaders from the design and construction industry together through our Corporate Advisory Board (CAB) as well as more than 50 diverse industry associations through our National Council for Civil

Engineering Research (NCCER). Through these linkages, CERF has focused on developing broad based, industry, academia, and governmental **consensus** R&D solutions to meet current economic and job related challenges facing our nation. Congressman George E. Brown, Jr., in a speech before a gathering of industry and government leaders, emphasized the importance to our nation that CERF and its Corporate Advisory Board play by being..."the hub of a communications/information network comprised of engineering, construction, and construction-materials-supplier companies throughout the nation."

DEFINING NATIONAL NEEDS

Our national needs are many, and clearly exceed the fiscal capacity to be resolved at once. It is therefore critical that we address, **first**, those national needs that, in turn, help resolve other national needs. In 1991, CERF conducted a National Research Needs Forum and published a report entitled Setting a National Research Agenda for the Civil Engineering Profession, which I have submitted to you with this testimony. What is unique about this report is that it is a nonpartisan identification of national research needs resulting from the cooperative effort of over 300 leaders from government, industry, and academia.

As your Subcommittee begins to formulate infrastructure related issues that could form the basis for an economic stimulus bill, I would like to suggest that you consider the **national needs and potential solutions** identified by this nonpartisan group as a means to significantly impact the economic and physical well-being of our nation in both the short- and long-term. Although short-term actions or responses may be needed to stimulate the economy, our focus should be on actions which will provide a strategic investment in our nation's future. CERF believes that the most important path to fundamental change is a long-term focus on programs that promise lasting positive impacts.

Therefore, I would like to suggest your Subcommittee consider three national needs identified in the Forum report which are critical to our nation's economic recovery. These are (1) revitalizing our deteriorating infrastructure; (2) creating a climate which stimulates innovation; and (3) reducing risk and liability associated with introducing new U.S. products and services into the marketplace.

1. Revitalizing our Deteriorating Infrastructure

CERF's National Research Agenda report identifies solving our national infrastructure needs as among its highest priorities, if not the highest. Why? Simply because our infrastructure is a primary and vital contributor toward national economic well-being, self-sufficiency, and international competitiveness. We seem to have forgotten or, at least, ignored this fundamental fact during the past thirty years, a time when we have chronically under-invested in infrastructure renewal, infrastructure revitalization, and infrastructure research and development. Today, however, the excellence and, indeed, the adequacy of this infrastructure is questioned; many see it as aged, in disrepair, or likely soon to be obsolete. Moreover, the construction-related sectors of the U.S. economy and **traditionally an important means of introducing people into the work force and enhancing their skills**, are now viewed as lagging behind other sectors in productivity growth and competitiveness.

Our infrastructure determines, in fundamental ways, what we as a society can accomplish. I know that you, as members of this Appropriations panel, understand better than others that transportation infrastructure components such as highways, bridges, airports, and mass transit are pieces of our infrastructure that influence our health, safety, and quality of life. Additionally, it is important to realize that our infrastructure also affects how *well* we accomplish many complex societal tasks. **Our productivity and international competitiveness rise and fall with the quality of our infrastructure.**

Meeting tomorrow's challenges with *even* today's technology will not work; we cannot compete in the 21st century with a 20th century infrastructure system! We simply cannot afford to ignore investing in our infrastructure systems. **We must act now, and we must act decisively.** *Infrastructure spending, if done wisely, such as balancing between short-term and long-term needs and incorporating essential research and development activities, is a strategic national investment in America's future!* In fact, the new Civil Infrastructure Systems (CIS) research initiative, proposed by the National Science Foundation (NSF) to enhance system performance and the longevity of existing and future infrastructure systems through intelligent renewal, will help our nation prepare for the next century utilizing limited resources.

Federal involvement in infrastructure related R&D is already substantial, exceeding $1.2 billion in 1992, as CERF has documented in a recent study. While substantial, it remains a relatively small percentage of the overall federal R&D investment of approximately $76 billion for 1992. Infrastructure transportation systems accounted for the largest portion of this investment, at approximately $429 million. What is not clear at this time is how much of this large effort is directly applicable to the transportation needs and opportunities that exist in states, cities, and local municipalities. It is time to make this determination and expedite the transfer of appropriate technologies!

As such, the Civil Engineering Research Foundation, in conjunction with the U.S. Army Corps of Engineers, is planning to identify dominant public works infrastructure system needs at the state and local levels and prioritize these needs. We will examine infrastructure related technologies developed within our federal laboratory system to determine which ones may offer potential solutions for identified public works needs. CERF will then consider the market potential of these technologies, identify potential manufacturers, develop optimal funding strategies, and recommend appropriate technologies for demonstration projects. This will provide private industry an opportunity to piggy-back onto federal R&D investment, and should lead to the commercialization of new products and the creation of new enterprises.

2. Creating a Climate to Stimulate Innovation

The second national need vital to our economic recovery is to regenerate and foster a climate of innovation. The emergence of the United States as a world leader in the 20th century reflects, in no small measure, the influence of an outstanding infrastructure built on the then new technologies introduced in the late 19th and early 20th centuries. This infrastructure supported several decades of unparalleled improvements in our industrial productivity and personal quality of life. The technologies, however, did not simply appear in some magical fashion; they were the result of a climate which encouraged and rewarded innovation.

Our foreign competitors seem to understand the value of infrastructure investment better than we do, as they invest heavily in infrastructure and work to put in place state-of-the-art infrastructure systems, systems that promise to position them as even more formidable economic competitors in the 21st century. A recent article in the Chicago Tribune, utilizing CERF's report entitled Transferring Research Into Practice: Lessons from Japan's Construction Industry, put our nation's competitive dilemma in perspective when it drew a parallel between the U.S. auto industry in 1972 and the construction industry of today. Japan's early emphasis on new innovative technologies and manufacturing processes for their auto industry have resulted in the Japanese now controlling 30 percent of the U.S. market. The U.S. cannot afford to let the same thing happen to the design and construction industry.

Let me give you a vivid example of what's happening in the U.S. today by describing a demonstration project CERF was asked to participate in last year. Charles Pankow Builders, Ltd., a renowned U.S. design-build firm and a member of CERF's Corporate Advisory Board, relayed to me their experience in attempting to convince the General Services Administration (GSA) that the new headquarters planned for the Mobile Alabama District of the U.S. Army Corps of Engineers was a unique opportunity to pioneer the essential partnering of the public and private sectors to achieve meaningful innovation through technology transfer. In this case, the technologies suggested for implementation, carbon fiber reinforced concrete exterior building cladding and precast concrete moment resistant frames, had the ironic twist we see too often: basic research accomplished in the United States, but implementation in Japan. Pankow's partners on this endeavor included the University of Michigan, the National Science Foundation, the National Institute of Standards and Technology, and Conoco, as well as strong support from the city of Mobile. What happened? The GSA response, in part, said, **"our agency is not in a position to technically lead the way."** Pankow's final letter to CERF about this project captures the frustration of our industry over the issue of **innovation and risk.** It said, in part, **"I surrender!...a contractor only hurts his business performance by supporting research. The litigious nature...provides the justification for the same attitude of only using proven technology. I guess technology can only come from outside the United States where it can be proved."**

The benefits of innovation transcend new technologies by themselves; innovation often leads to less expensive options, thus providing our decision makers with the opportunity to obtain desired facilities at less cost, or additional infrastructure for a given level of expenditure; leading to more jobs and new markets. Innovation is a viable solution to stimulating our economy.

3. Reducing Risk and Liability

The third area requiring immediate attention is to remove what is truly a national "millstone" around our collective necks, namely the specter of liability and risk that so permeates private and public decision making that innovation is stifled and necessary research and development postponed **because risks overwhelm potential benefits.** *Even the largest design and construction firms in this country, acting with complete responsibility and social awareness, are simply unable to face the financial consequences of potential litigation.* We have created a prescription for disaster. Unless we collectively solve this truly national need through risk sharing, federally backed demonstration programs, and public education, we cannot succeed in fostering innovation or putting into place the infrastructure that must be created for the United States to compete and care for its citizens in the 21st century.

This is a problem that requires the most imaginative solutions and the most compelling national commitment, particularly the commitment of the Congress and the Administration. You must help find ways of reducing risk and liability. **The bottom line is clear: infrastructure revitalization and innovation depend upon risk and liability minimization, while maintaining adequate social and professional responsibilities.**

SOLUTIONS: COOPERATIVE NATIONAL PROGRAMS

Let me now suggest to you that a vital and proper response to these needs are national cooperative programs. What I refer to as national programs are necessary for one compelling reason: the scope of the problems and needs we face are far beyond the capability of the private sector alone, government alone or academe alone. **Cooperation by all interested parties is essential to maximize the benefits from new innovation:** CERF is therefore already working through this tri-partite coalition to create national programs. I would now like to briefly describe two of these efforts; the first is a national program on high performance construction materials and the second is the creation of a highway innovative technology evaluation center.

High-Performance Construction Materials

I have suggested that a revitalized infrastructure is essential for America; one important component of that revitalization is development of high-performance construction materials. We are now often using construction materials that have changed little since the 19th century. For the past two years CERF has coordinated an industry-driven planning committee involving experts from both the public and private sectors. The result is a proposed national program: *High-Performance Construction Materials: An Essential Program for America and its Infrastructure*. The impetus for this program emerged during the 1991 National Civil Engineering Research Needs Forum I mentioned earlier. The program envisions a ten-year, $2 to $4 billion research and development effort, encompassing traditional and emerging construction materials, with initial focus on concrete and steel. Liaison with the Presidential Initiative on Advanced Materials and Processing has been developed and is being maintained in order to facilitate the desired and necessary participation of key federal agencies in this national program.

Federal support and participation of this ten-year national program would be coordinated through the Presidential Initiative on Advanced Materials and Processing of the Federal Coordinating Council on Science, Engineering and Technology (FCCSET). Federal support, in addition to current base R&D activities, is estimated at $40 million a year for concrete and steel. Estimates of federal research funding requirements for other construction materials such as composites, aluminum, masonry, timber, asphalt, and protective coatings are being developed; estimates are in the range of approximately $160 million per year. Industry support, direct and in-kind, is expected to complement federal funding. The plan for this national program will be published and available in the near future and will be submitted to the President and Congress for consideration.

I strongly suggest to you that this proposed national program for high-performance construction materials is an outstanding example of the long-term national cooperative programs which must be initiated now, **with your support**, in order to improve our infrastructure and our international competitiveness. CERF, in cooperation with federal agencies and the private sector, will conduct a one-day symposium on April 29, 1993, to present program details and build the consensus support needed to start this vital national initiative.

Highway Innovative Technology Evaluation Center

I suggested earlier in my testimony that fostering innovation is one of three imperatives. We must, again, collectively remove the barriers that now stifle innovation in the United States. It is a fact, repeated time after time, that American innovation ends up being implemented elsewhere and exported to its birthplace! Let me briefly describe the second of the two national programs I mentioned which focuses on transportation issues: the Highway Innovative Technology Evaluation Center (HITEC).

Under a multi-year cooperative agreement with the Federal Highway Administration, and in close coordination with the many facets of the highway and civil engineering community, CERF is in the process of establishing HITEC which will be located in McLean, Virginia.

HITEC's goal is to become a nationally recognized service center and clearinghouse for implementing highway innovation.

This past September, a national Workshop on Implementing Innovative Highway Technology was organized by CERF, FHWA, TRB, and AASHTO. The workshop brought together a broad cross-section of representatives from both the public and private sectors. What emerged from two days of candid and comprehensive discussions was both an affirmation of the need for HITEC and an "action plan" to guide HITEC's initial development.

Congressman Norman Y. Mineta and Federal Highway Administrator, Tom Larson were two of the officials who addressed the workshop attendees and added their endorsements to the HITEC plans. Mineta told the leaders the "challenge is fusing together the innovations we need to build [a] new world of tomorrow...a world in which well-built highways link up easily with transit, and transit links up with airports, and airports link up with freightways...efforts like CERF's [HITEC] will make that possible."

HITEC will serve as a focal point for evaluating new technologies (products, materials and processes) and help to expedite their transfer into practice. By providing impartial evaluations of technologies where no industry standards exist, it is hoped that HITEC will enhance the incentives for private industry to invest in highway oriented research and development and for state and local governments to implement innovative products in the highway system.

I believe it would be instructive to give you a short summary of some key elements of the HITEC plans as we now see them, which build upon the recently enacted Intermodal Surface Transportation Efficiency Act (ISTEA).

- Through a **"consensus based approach" and "pooled funding mechanisms"**, the traditional risks of introducing new products will be "shared" more equitably, thus encouraging more investment in both researching new ideas and introducing new products.

- Innovators, private companies, or public entities with new products will be able to work with technical panels organized by HITEC to plan and implement the necessary real world evaluation and testing efforts to demonstrate to the highway user community that the product works, is safe, and will provide demonstrated benefits if applied.

- HITEC will have a national focus, but will not be a federal program. In fact our goal is to build new, unprecedented alliances between government (at all levels), private industry, research facilities, and other key elements of the highway community.

- Although the federal government is providing seed money to get the center operational, HITEC intends to become self-sufficient.

- Likewise, although existing federal grant monies will probably be tapped to help support companies who cannot afford to finance the "technical evaluation fees" for their products, these federal monies will hopefully be leveraged or pooled together with funds from other sources in order to maximize the total impact of the monies spent. **Continued funding under programs such as ISTEA Section 6005 will be an important element of HITEC's success by providing matching federal funds to evaluate and demonstrate new innovative highway technologies.**

- HITEC will not duplicate existing programs or institutions, but rather will provide a "value added service" to both private sector companies trying to introduce new products and users of those new products (state and local government entities). HITEC will not be a specifier or a standards approval agency. Likewise, HITEC has no plans to develop a large staff or its own testing facilities; rather, it will utilize existing facilities and limit its role to that of "coordinator and catalyst."

Needless to say, much work and many challenges lie ahead, but we are committed to making HITEC a reality because we believe the expected benefits to our nation are obvious.

Innovative methods, products and services will have fewer roadblocks to overcome through HITEC on their way to the marketplace and risks for participating organizations will be substantially reduced. This should lead to new market opportunities, new U.S. products and services, new businesses, and therefore more jobs for the U.S. workforce.

I would add that the concept of an innovative technology evaluation center is not confined to highways or transportation. CERF is already working to establish similar centers for environmental and building technologies.

THE NEED FOR CONGRESSIONAL ACTION

I have suggested to you that national problems and needs can be solved through coordinated, cooperative national programs that integrate the expertise and resources of industry, the public sector, and academia. I urge you to support programs such as HITEC, High Performance Construction Materials, and other nationally coordinated cooperative programs. The costs associated with these efforts, while not insubstantial, are minuscule when compared to other federal programs. The potential benefits, however, far exceed costs, and are, in fact, the basis for our long-term prosperity. We have the opportunity and the challenge of making a wise investment for tomorrow's Americans.

It's time to shift the **paradigm**; time to implement new ideas and methods which differ from the norm; and time to remove the barriers to innovation in the U.S. which are stifling the creativity of our industry, and thus limiting our opportunities to stimulate the economy. We must begin working together to create an environment **more conducive to innovation; one that moves away from adversarial relationships and promotes cooperation.**

Mr. Chairman, the Civil Engineering Research Foundation greatly appreciates being given this opportunity to present the views and convictions of the civil engineering professionals on whom this nation must depend to make our 21st century infrastructure a reality. I hope my comments and the additional information I have placed into the record will be helpful to the Subcommittee as you consider an economic stimulus bill. This concludes my remarks. I would be pleased to respond to any questions you may have.

Civil Engineering Research Foundation

CERF is an independent, not for profit 501(c)(3) organization created by the American Society of Civil Engineers. CERF began operation in 1989 to bring together diverse groups within the civil engineering community to facilitate, integrate and coordinate common solutions to complex research challenges facing our nation and the civil engineering profession. CERF works with the design and construction industry to expedite the transfer of innovative research results into practice.

American Society of Civil Engineers

ASCE was founded in 1852 and is the oldest national engineering society in the United States. Membership, held by more than 110,000 individual professional engineers, is about equally divided among engineers in private practice; engineers working for federal, state or local governments; and those employed in research and academia. The Society's major goals are to develop engineers who will improve technology and apply it to further the objectives of society as a whole, to promote the dedication and technical capability of its members, and to advance the profession of civil engineering.

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LIST OF ATTACHMENTS
TO TESTIMONY
by
HARVEY M. BERNSTEIN
BEFORE
APPROPRIATIONS SUBCOMMITTEE ON TRANSPORTATION & RELATED AGENCIES
FEBRUARY 4, 1993

1. Pamphlet: "Infrastructure - A Good Investment", Dec. 1992

2. News Article: "Not Level With Competition", Chicago Tribune, Nov. 1992

3. Published Article: "Tort Liability: Limiting U.S. Innovation", CE magazine, Nov. 1992

4. Published Article: "Tearing Down Roadblocks to Innovation", APWA Reporter, Feb. 1992

5. Published Article: "Is Innovative Engineering Becoming Extinct in the U.S.?", American Consulting Engineer, Fall 1991

6. Press Release: "Government & Industry Leaders Plan for Highway Innovation & Job Creation", Nov. 1992

7. Report: "Summary Report on The Creation of a Highway Innovative Technology Evaluation Center (HITEC)", Nov. 1992

8. Press Release: "CERF Completes Study Evaluating Federal Public Works Infrastructure R&D", Jan. 1993

9. Press Release: "High Performance Construction Materials Identified as Vital to U.S. International Competitiveness", Dec. 1992

10. Published Article: "Forget the Bottom Line: Invest in R&D", CBR, January/February 1992

11. Newsletter: CERF Currents, Fall 1992

12. Executive Summary: "Setting a National Research Agenda for the Civil Engineering Profession", Sept. 1991

13. Report: "Transferring Research Into Practice: Lessons from Japan's Construction Industry", Nov. 1991

CAPACITY TO HANDLE SHORT-TERM STIMULUS

Mr. CARR. Thank you, Mr. Bernstein. As I mentioned, we are anticipating a short-term stimulus package and we are also looking forward to a fiscal year 1994 request from the President. They may have some similarities as we try to develop the criteria, but I think it is clear that short term is a bit of a problem.

Mr. Bernstein, if the President says we are going to have a short-term stimulus package and some of it is going to be infrastructure, whether we agree with the school of thought that says that is not a productive thing to do, we may get it anyway. So how do we make the best of a bad situation?

The thing that plagues me is this notion that at any one point in time, because we have guaranteed a fairly constant through-put of dollars in the infrastructure area, it seems to me that the construction, repair and maintenance industry that supports that has sided itself, relatively speaking, to that constant flow. If you are going to automatically then surge dollars into that system, at what point do you push capacity toward 100 percent?

There may be still lots of people out there who are unemployed and who might, with available equipment and other things, be able to be put to work, but once you have all the bulldozers running and the like, you are not going to be able to surge past that point, it seems to me.

And you are the economists out here. When we get past that point, the closer you get to 100 percent capacity, you start fiddling around with prices, so you just pay more and get the same thing. So at some point you may actually give windfalls to folks. Highway department people around the country tell me right now they are getting some pretty good prices because it is very competitive.

Now, one aspect, Mr. Bernstein, is that it seems the capacity problem is somewhat equipment limited, and I hope somewhere along the line someone might advise us on how we measure that; find out where, in any one snapshot of time, we figure out what the available equipment limitations are. And another limit is the available population of environmental consultants to do environmental studies that are required under the law. And, presumably, that is another chill point.

But also, it seems to me, at any one point in time, again, over time, over long programmed growth you could size the industry to a different size, but in an emergency stimulus package, there is just so many civil engineers on any one day of the week and at some point those civil engineers are at work.

Do you have some measures inside your association that tells us what level of capacity we are at in the civil engineering world? Is there excess capacity in the civil engineering world that, in the short term, not how many engineers might shift from one discipline to another three years from now, but if we get a stimulus package, is there enough? What is the capacity of the civil engineering world to absorb a surge of dollars?

Mr. BERNSTEIN. Well, Mr. Chairman, in the short term, over the last few years, with the downturn in the economy, many of the construction firms and organizations that we deal with have had to lay off people and have their unemployed engineers out there and available dormant equipment that can be used on infrastructure related projects.

But I think your question speaks even to perhaps another issue, and that is what is capacity, productivity capacity and innovation offers us, even if you were employing all civil engineers and using all existing equipment, opportunities for efficiencies in projects, whether it is through even new methods, forgetting new technologies, new construction methods. There are existing technologies right now and materials that have been developed under the Sharp program that have been developed with regard to design and that would allow——

Mr. Carr. I don't mean to interrupt but I want to keep the focus on a short-term stimulus package. New innovations and technologies take a while to spin out into the economy. We are talking about dumping a pot of money on a problem tomorrow and trying to get some economic output of some kind in, hopefully, one, two, three quarters.

I don't think, unless I am really wrong about what innovations you are talking about, that the productivity benefits from innovation are available to us in such a short-term time frame. And my question was really what is the available population of civil engineers today; how much additional capacity could be used by a short-term stimulus package in the next three months, four months, six months; or have there been so many firms that have gone out of business or laid off or restructured—are we at engineering limits today? I guess that is the question.

Mr. Bernstein. I follow your question. In the short term I don't believe we are at engineering limits. I believe there are resources and people available, and I would be happy to try to just research and provide some numbers back to the subcommittee for your use.

Mr. Carr. That would be really helpful. I think you know what I am getting at here. Are there measures out there; are there tools available to decision-makers like ourselves?

We did a little survey, and ours was not scientific and we won't make great claims for it, but our guess was that we could only surge, at most, $2 billion in highways, maybe $700 million in transit, before you start running into or you cause diseconomies of various kinds.

Dr. Hulten. I don't know the answer to the question, but I would augment it to include the question of whether or not this additional spending will be used efficiently if it comes in above and beyond the new obligation levels of ISTEA. One possible way of getting at this question is to study the experience in spending the ISTEA money.

Dr. Penner. I have always been impressed, Mr. Chairman, just at the delays before you can actually spend the money. It seems to me as a general rule the planning delays, the regulatory delays, you mentioned the choke point of environmental impact statements, there are all sorts of things like that that we have to deal with before a project can get started.

I am not experienced in the highway area, but I know from looking at housing quite carefully that once all of that is done, the construction industry can respond very, very quickly.

Mr. Carr. Well, one of the things, and the question I asked in my opening statement was, ISTEA was really not built for speed. Whatever its merits or demerits, it was not built for speed. If we are going to have a stimulus package that is designed to get out funds right away, is ISTEA the authorization mechanism that we ought to be using?

Dr. Schwab. As I understand the recent experience with ISTEA, speed is clearly not what we have seen. The money really has gone out slowly, more slowly than had been anticipated.

Mr. Carr. Would you generally agree with my proposition, then, that if we are to have a stimulus package, putting aside the merits of doing it, but if we are stuck with it because that is what the politics of the day dictate, do we need essentially to bypass ISTEA or waive some of its requirements for the purposes of this particular supplemental to try to streamline it in some place? Is that a fair statement?

Dr. Schwab. Well, I think I would guess that the three of us would go a bit beyond that and suggest that infrastructure, regardless of the way we choose to fund it, is probably not the right avenue for a stimulus package. We could all buy a car or do something else to stimulate the economy.

Mr. Carr. I will give everyone permission to do that.

Dr. Schwab. A lot more quickly. If that is the goal, if you want to put money in people's hands, you can do that much more quickly by putting it in the private sector.

Mr. Coleman. Of course, a third of them are Toyotas.

Mr. Carr. I don't want to take up too much time here, because I know we will have another panel at 11:00 and we have other Committee members who want to ask questions.

Let me just throw out a couple of general propositions, not for the immediate surge but for our longer term problem, as we consider a sustained level of funding in fiscal year 1994 and beyond and whatever else comes down the road in two years, four years.

I would agree with you, Mr. Bernstein, that we really need to do a lot more in research. The sense I get from reading all of your materials—and I say "you" in the large economic sense, the economy sense—is that there is some consensus forming around the idea that our investments ought to be of higher grade, let's say more durable quality; that we have not done as good a job as we could; that we should have assets that last 30 years, maybe a little longer, instead of 20 years.

We in the northern part of this country, face some really serious problems in terms of freeze/thaw cycles and the durability of our highways in terms of climate conditions. I would say very much that we ought to do research on materials.

But getting to economics, we have a new Bureau of Transportation Statistics, which, to the best of my recollection in the last year, had not really been fully up and running. I would hope that along the way you might advise this Committee, maybe not today, but along the way, about how we ought to help them get the tools and the data available to make some of these key decisions.

And, Dr. Schwab, you mentioned criteria, cost benefit analysis. I think we are really babes in the woods at trying to figure out how we do that. Otherwise, we are back to doling dollars not investing but doling them out. And what books like this and editorialists don't point out is that we do the best we can—sometimes with really weird results, but we do the best we can—but we don't really have a lot of good tools and data and statistics to help us say how do you measure the rate of return; how do you measure the displacement value, that is the productivity in this particular investment versus the productivity of other public or private investment that it displaces.

I think we can see all around us examples, at least hindsight examples, where public investment has actually dragged the economy relative to what productivity could have been achieved if that money had been left to do other things. How do we measure that; how do we get a hand on that? So we really need some help here. This hearing is in part a plea for some help on how do we do a better job. Dr. Hulten.

Dr. HULTEN. Well, as a user of highway statistics, I would very much hope that you could help this new bureau to develop a program and give them the appropriate funding to make data available to users, like Bob and me. It is difficult at present to get the kind of data that we would like to have for our studies.

We have been studying the regional impacts of infrastructure, and we would have benefitted from better data on the regional distribution of expenditures, on the type of road and source of funding, so I have this is an issue that will be pursued.

Mr. CARR. Well, we want to make use of this Bureau of Transportation Statistics, but it is only going to be as useful to us as it is constructively created and nurtured, and so maybe you could help us.

Mr. DeLay?

Mr. DELAY. Thank you, Mr. Chairman, I congratulate you on the quality of this panel, and I apologize to you in that I am going to have to miss the next panel because I have a leadership meeting that I am tempted to miss except I am chairing it.

Mr. CARR. The burdens of leadership.

Mr. DELAY. This is just very stimulating conversation, particularly in light of what is going on around us. I had an opening statement, Mr. Chairman, that I will just pick out pieces of it because you are so knowledgeable in this area you have pretty well made my opening statement for me.

There is just a couple of things, though, that I would like you to respond to. Instead of layering on more spending, without looking at the wastefulness in the spending that we are doing, could we accomplish, what the President is trying to accomplish by making our spending on infrastructure now more efficient? Consider a couple of thoughts. As you well know there have been numerous studies that have shown State and local governments respond to increased federal infrastructure spending by reducing their infrastructure spending. Increased federal spending also leads to inflated costs, like those that the chairman has touched on. There are wastewater projects which receive federal funding, boosting costs as much as 30 percent more than those same projects when they are funded locally.

You have the so-called National Crisis of Infrastructure Decay that I think is largely a regional phenomena, where you have one-third of the nation's structurally deficient bridges are just in four States, Missouri, New York, Ohio, and Pennsylvania. And New York alone accounts for nearly half of the four State total.

In 31 States less than 10 percent of the interstate highways are deficient and in five States 35 to 40 percent are deficient.

There is more than 30 government regulations, Davis Bacon, Buy American, Minority Set Aside, Environmental Impact, Endangered Species, and I could go on and on and on, which I think reduce competition and inflate construction costs by as much as 50 percent. Much of the research that is available does not support the claim, as you have so aptly pointed out, some of you have, that additional infrastructure spending would provide a greater benefit.

I think rather than jumping off and layering on more spending, it leads me to a question, Mr. Bernstein, of you. If I heard your testimony right, if we took the entire $1 trillion spending of the United States, we could have full employment in the United States, because the more spending that you spend on infrastructure, the more employed you have so everybody could be employed.

So the President could come in and set a number of jobs he wants to increase, put a tally on that, and we spend that much and that many people would be employed and the economy would be hunky-dory. Am I misrepresenting your testimony?

Mr. BERNSTEIN. Congressman, I would like to clarify my emphasis was on increased investment in infrastructure as a percentage of the infrastructure investment. I am not necessarily pushing you have to continually throw money at infrastructure.

I do believe, though, there are many inefficiencies in the way the funds are being used in the infrastructure area right now, and because those activities, because of current contract delivery systems, low cost bids, there are so many barriers and disincentives for being innovative, you end up getting poor quality, the cheapest material, the easiest design, in many cases, because of the way we contract for those services. And either we have to modify the contract delivery systems or find ways to introduce new innovation into those same projects and same funds. I believe through that, we will achieve more efficiency by creating more jobs.

I was not advocating throwing more money in infrastructure, strictly infrastructure R&D, to achieve some optimized benefit and reward for the investment made.

Mr. DELAY. I am glad you cleared that up for me, because I saw Robert Reich on CNN this morning, and I might also point out for the record that he is not a trained economist, even though he sounds like one when he talks, he is a journalist and a lecturer, and it strikes me that the President could do both. When Secretary Reich said we want to spend more but we want to have deficit reduction at the same time, those statements are contradictory. Where I think we could, or at least this Member could suggest to the President and the Secretary that there are outmoded rules and regulations if corrected would free up more money, and, therefore, accomplish both deficit reduction and spending increases without raising taxes.

Dr. Penner, and anyone can respond, would that be a better way to accomplish the President's goals than just spend more money and hope that the deficit will go down?

Dr. PENNER. Well, I am a strong believer in keeping your eye on the long run as opposed to the very short run. I rarely favor these short-run stimulus programs and I certainly would question one right now at this moment in our history with the economy recovering.

I think there is doubt about the effectiveness of short run stimulus programs at all levels. You have raised the question, how much really does an extra dollar of spending all by itself stimulate the economy, regardless of what it is on. And I think the day we should sort of religiously follow the really old-fashioned Keynesian economy of economics is long past. We live in a very different world now with a lot of many stimulus, for example, just going abroad very quickly because of the international relationships.

So I would question whether it is effective. If I am wrong about that and it is effective, I would question whether you ever get the timing right, and I would particularly suggest this is the wrong timing. And then there is——

Mr. DELAY. Let me stop you there, and I apologize, but what I am getting at is, it seem everything I read and everything that I hear, and you just said it, this is not the time for a stimulus package. Could the opposite be true? Is now the time to take advantage of efficiencies, the way I put it out on the speech trail; to get the government off the backs of businesses, look at these efficiencies and not wait for the economy but help it? That idea is sort of a stimulus in itself, is it not?

Dr. PENNER. I think you are absolutely right, a stimulus through the longer run growth aspects of the economy, which is what we should keep our eye on, I guess. I think any time is a good time for efficiency, and it really doesn't matter much what the short-run state of the economy is.

But this may be, because of all of our concern about the way the deficit problem seems to be getting worse and worse, a time when there is a bigger incentive to search out the kind of efficiency you are talking about.

Mr. DELAY. Including something so outrageous at times such as a cost benefit analysis of transit systems, not just building a fantasy transit system, like they tried the Houston. Those are the kinds of efficiencies that I'm speaking about. Even if we don't increase ISTEA spending or don't lay on layers of spending, we should look at ISTEA and make sure we correct some of the problems that drive building monuments to infrastructure.

Dr. HULTEN. I would certainly endorse the increased use of benefit cost analysis. I also think we ought to take another look at the federal grant design as well. Very high matching grant rates can have a disincentive to efficient use of resources because they make the dollars that a State spends seem very cheap to the State, and this weakens the ability of the people who assess benefits and costs fight off raids on the dollar.

In terms of efficiency, this is another dimension that I think needs to be opened up.

Dr. PENNER. Could I endorse that suggestion very strongly? I really do think we could do a lot better with the money we have with a somewhat different grant system. As Mr. DeLay said, there is a sense in which the current one might even discourage States and localities from spending money under certain circumstances.

Mr. DeLay. Mr. Chairman, will we be able to submit questions to this panel and will you answer our questions in writing if we could?

Dr. Schwab. Absolutely.

Mr. DeLay. Because I have a bunch of them, Mr. Chairman, and you have other members here. This is really exciting testimony.

Mr. Carr. Well, I thank you, and with your cooperation, I think that there would be some questions we would like to propound to you. I know I have some. But in the interest of keeping a commitment to people who were told they would be testifying at or near 11:00, we want to stay pretty much on schedule.

Mr. Coleman?

PROVIDING ECONOMIC OPPORTUNITIES

Mr. Coleman. Thank you, Mr. Chairman, I would just say that I sense somewhat a certain smugness in the attitude that the economy is getting better and everything is really going to be all right. I happen to think the United States position in the worldwide economics is not very good. I think that the United States had better be concerned about issues like international trade and I would invite the members of the panel to my region of the country along the U.S./Mexico border and suggest to you that what we are doing with respect to infrastructure in that arena has been woefully short.

Indeed, I have worked very hard in my decade here in Congress to get past administrations, past highway departments, past GSA heads to pay attention to the issue of bridges, roads, airports, the total infrastructure need in order to facilitate commerce between countries.

In fact, I think the North American Free Trade Agreement, whether this one or some future one, at least has begun to highlight some of the problems along the U.S./Mexico border. Four in ten residents along that border, by the way, and they are American citizens, reside in poverty. That is three times greater by the way than the national average.

I think that President Johnson's great society moves were valid. I happen to think President Kennedy's attention to the Appalachia region was for a purpose. The idea that transportation didn't play a role in any of that is mistaken. So a lot of us are not going to have to be brought along kicking and screaming to the idea a short-term stimulus package is indeed necessary.

And I think keeping our eye on the long-term, Dr. Penner, is exactly right, and I think the long term for this country doesn't bode very well if we think we can keep up internationally, as was suggested by Dr. Bernstein in his testimony when he used the model comparing the Japanese and the United States in the auto arena from the 1970s to the 1990s, and I happen to think that we have, if we think that we can stay static or do very little to facilitate more commerce between nations in this hemisphere, I think we make a great mistake.

In my opening statement, Mr. Chairman, that I didn't make, I intended fully to point out the fact that a lot of us along that border are hopeful that we will be able to have better economic opportunities provided, not just by the jobs that are created for a road building project. I happen to believe strongly when you build a road that permits people to get to health care centers, that permits people to be able to transport themselves to stores and shops, that stores and shops grow. There will be a filling station and other things along that road or highway that is built. It seems to me we think of it only in terms of concrete.

I would hope that a lot of what you said today is taken with that certain grain of salt maybe we all tend to regionalize it. I know I do. I think all of us on this committee do. Our chairman, a minute ago, was talking about the auto industry, certainly extremely important in his district, but infrastructure needs in my district are crying out for answers and solutions.

We can raise our taxes locally, by the way. You highlighted the fact we need to raise taxes locally oftentimes to address this. We raised local taxes a nickel on $100 evaluations, and we raise 1 percent of what some districts do if they have got oil on their land, and their ad valorem tax base is much higher. We know it is much higher in Maryland than along the U.S./Mexican border or in Virginia.

I would only say to you whether we make the efforts for education or other services, that efforts yield back very little, and that is why, in fact, I am convinced that past presidents that saw the needs in different regions of the country have made that effort. And so a lot of us that supported President Clinton believe strongly this kind of a stimulus package was important not just to the future of us locally but indeed to the future of this country.

I don't think any of us have to scramble to find out how far back we have fallen as a nation in terms of international trade. Look at the deficit. I am talking about the trade deficit. We applaud the fact that the deficit has gone down. We are adding to the deficit every day in international trade and we act like that is somehow wonderful. It is the same way when we say we will cut the deficit in half. Woops, well, we still added another couple hundred billion dollars to the $3 trillion national debt.

It seems to me while we pat ourselves on the back, that smugness just has no place, and I am one of those that think it will be extremely important for us to begin to address these issues. And I would say that one of the questions that Dr. Penner raised, that I respect was, and I think it was raised also by the professors from the University of Maryland, was that we should have some return on our investment. We need to compare that, and I totally agree.

But I would say to you that let's do look at the overall big picture when we talk about return on investment. How important is it for a business in Mexico—oftentimes, by the way, a United States business today, to be able to move their product to New York or to Chicago or Los Angeles efficiently and effectively, we cannot do that today because we don't have the infrastructure in place. We don't have the rails that connect, we don't have the kind of aircraft, freight systems that permit us to do those kind of things.

And the trucks and the cars that were mentioned earlier are critical and extremely important today to moving that commerce. It goes both directions, by the way. Hopefully, if in fact a North American Free Trade Agreement does what the past President, President Bush, said it would do, then that commerce will be going the other direction as well.

So those were my opening remarks and I wanted to make those and let anybody comment in the interest of time.

Thank you, Mr. Chairman.

Mr. CARR. Thank you. Anyone want to make any comments?

Dr. SCHWAB. Just briefly. I couldn't agree more that these are obviously difficult times in terms of international competitiveness. We have a scarce number of dollars that we can use in this battle we face with nations including Japan. It is not clear at all to me, though, that the right way to allocate those scarce dollars is in terms of additional spending on infrastructure. There is no question in my mind that we do face a tough fight, but given that we face such a tough fight, we need to use the resources incredibly carefully.

Mr. COLEMAN. I happen to agree. I don't think it is a panacea. I would hope nobody listening to testimony or reading it in a transcript thinks that some of us believe this is the answer. It is not. But I think it is a piece of an answer. So you and I may disagree to what percentage of the answer it is, but I would say I think it is certainly a component of a part of what we need to do.

Let me say to you, in my district alone, I literally have people that cross the border into Mexico in order to catch a bus, in order to come to the main part of downtown Chihuahua, which is city of million and a half or 2 million people, to get downtown, so they can cross into the downtown city of El Paso, a city of about 600,000 people, in order to get on a bus to go to the general hospital. Those are American citizens. Why? Because of the infrastructure capability.

And, by the way, somebody earlier said we should put more in public transportation than infrastructure. I will tell you my definition of infrastructure includes that. So I don't mean just roads. I include public transportation. But we don't have the infrastructure capabilities to move American citizens totally within our own country to do the kinds of things that I am talking about, just to get health care.

Unfortunately, that kind of health care is also the worst. They are going to a general hospital and sitting in an emergency room, which was another problem we slightly only alluded to a minute ago, and no sense in getting into that one. But the point is, while it is not the panacea, it is a component of trying to deal with serious economic problems facing America. Yes?

Dr. HULTEN. It sounds to me like your particular area has unusual infrastructure needs and will continue to do so under NAFTA. It seems to me that part of the efficient use of our dollars is the ability to channel our available resources to those areas where needs arise.

The current system, to some extent, hinders that because of these so-called minimum allocation rules which throw back a very large fraction of every dollar raised in each State to that State. So, where we have a situation like the one you are describing now, it is hard to redeploy the money.

So, in terms of the issue you raised, Mr. Carr, about how can we spend highway money better and what happens if we have to spend a large increment in the short run, I think that these minimum allocation rules are something that really need a very careful look.

Mr. COLEMAN. Thank you.

Mr. CARR. Thank you. Mr. Price?

THE NEED FOR A STIMULUS BILL

Mr. PRICE. Thank you, Mr. Chairman. In light of some of the earlier discussion, I think it is important to remind ourselves that while one element of this anticipated package is short term and is conceived as a stimulus, an aid to economic recovery, particularly when we are talking about infrastructure, that is not all we are talking about. We also are talking about an investment that presumably underwrites long-run economic development and economic growth.

So very quickly here, I would like to ask a question about each of those elements, because I think both are important and it is important to keep them in tandem.

But first let's talk about the stimulus aspect and the extent to which some of this activity might have a desirable short-run impact. Both Mr. Penner and Hulten express skepticism about this idea of projects being ready to go.

Dr. Penner, in particular, let me just quote one sentence: "If a new program was enacted tomorrow, I feel confident in predicting that far less than one-half of the appropriations will have been spent one year from now and there will still be significant spending five years from now."

The American Association of State Highway and Transportation officials has prepared a lengthy book, as I am sure you know, I have it right here, entitled, A Report on Ready-To-Go Projects of the State Highway and Transportation Department, which outlines many projects which supposedly are ready to go. Now, we all understand the political motivation for putting such a book together, and I think it is admirable the speed and efficiency with which this was placed before us. That doesn't mean, though, that it is necessarily wrong or that these claims are without foundation.

So my question is, are they mistaken? Is it a totally misleading idea that these projects are ready to go? If AASHTO is mistaken, why are they mistaken, and are there any projects that represent or any sort of projects that represent an exception to the generalizations, the pessimistic generalizations that you have made?

Dr. PENNER. Well, I guess, Mr. Price, that probably showing my age, but I have been through this before. We went through it with the so-called Accelerated Public Works Program of President Carter when such books were prepared and it was promised that things would be ready to go, and in fact many, many years later we were still spending on the projects initiated then.

The chairman noted in his opening statement the kind of GAO study of the 1983 experience. So let's say that I think usually those kinds of books are just prepared with a considerable dose of optimism and then when you actually really try to get things going fast, you run into all sorts of barriers and many of the most significant are the regulatory barriers that Mr. DeLay referred to, even when you think you have done it, complied with all of the various regulations, they always seem subject to challenge by some group, some interest group that doesn't think its concerns were taken care of.

Mr. PRICE. At the same time, though, I think all of us have experience in our individual States with projects that have cleared those regulatory hurdles and the pace of those projects is essentially being determined by the flow of funds. Such projects supposedly are the ones listed here. Are there any exceptions to this pessimistic generalization? Any type of criteria we might profitably employ?

Dr. PENNER. I didn't mean nothing would be spent obviously for a year. I used the number one-half. That is probably optimistic, but certainly there are some projects of that type, no doubt about that.

Dr. SCHWAB. I do think certain projects are less likely to be subject to regulatory delay than others. In particular there are many projects we really need to look at the environmental issues very, very carefully but they don't arise in certain types of projects, resurfacing projects, for example, I would guess would rarely cause significant environmental concerns.

So I would look for projects that are less likely to run afoul of environmental regulations if I were to take a first cut of projects to think of funding.

Mr. PRICE. Well, turning, since our time is limited, turning to that question of the longer-run impact, here too we have some very mixed assessments on the part of economists and others. We will be hearing some of this from our next panel, very mixed assessments about the longer range impact. Let me just encourage that kind of dialogue by quoting for you from a CBO study: "while further carefully selected investments in public infrastructure may well be productive, there is little evidence to suggest that substantial across the board increases in current programs would be more productive on average than private investment."

I gather the studies in general show higher returns for maintaining the existing stock of infrastructure and expanding capacity in some areas, such as congested urban highways, runway capacity, air traffic control at major airports. These sort of things show a higher return than new projects. Rates of return presumably would be far greater on highway maintenance spending than on projects to expand capacity in general.

Well, that raises, obviously, some questions. Number one, about the degree to which this kind of public investment would crowd out private investment, the extent to which there is a direct trade-off and then secondly about the payoff for the public investment itself.

Any comments any of you would care to offer on that assessment of these issues?

Dr. PENNER. Well, I would go back to the theme of the first part of my testimony; that it is really very difficult to generalize. I am quite prepared to accept Mr. Coleman's argument that there are some extraordinarily high rates of return, public investments in his area. I really would emphasize the importance of project evaluation again or cost benefit analysis.

I think cost benefit analysis takes into account all of the things that Mr. Coleman mentioned and enables you to differentiate the good projects from the bad projects.

Sure, there are a lot of problems with that kind of analysis. It has been mentioned we lack the statistics, we lack some of the concepts that you have to use, for example, putting valuations on commuting time saved are somewhat mushy, things of that sort.

But, nevertheless, it is the only tool we have and we actually refrain from using it, quite frankly, on many occasions for purely political reasons.

So that I would suggest that we should do everything in our power to beef up the capability somebody said what should be done in CBO, it was an old CBO person. I don't necessarily think that is the good place for it. I do think it should be in the executive branch with the CBO commenting on the techniques used and whether they are biased and so on. But I think it is a role for the managers of these programs.

Mr. PRICE. Sir?

Dr. HULTEN. I would generally subscribe to the CBO assessment. Perhaps strongly so. But I think it also needs to be recognized that infrastructure has very complex effects on economic development. There are times when infrastructure is crucial and leads development. The opening of the west by the railroads is a standard example.

But there are other times when a country has reached a size of infrastructure where further additions have very minor impacts, and it seems to me we need to recognize this when considering how much extra spending is needed.

Certainly the CBO results are consistent with having reached a matured infrastructure system that is essentially satisfying our needs. That is not to say this is going to hold forever and that there are not particular types of infrastructure, or particular places like the border with Mexico, where we might get a very large payoff.

In other words, I think we have to distinguish the stages of economic development and the role of infrastructure in each of those stages.

Dr. SCHWAB. Just briefly, I really think that Congress is in a very difficult position. As Congressman DeLay mentioned, these problems are often local, in a sense, bad bridges are concentrated in a handful of States, congestion is not a problem throughout the entire country, but there are clearly a dozen or so major cities where congestion is a very serious problem. Cost benefit studies can get at these kind of questions.

But then, of course, you are left with the question what do you do if you find out that there are only a dozen or so fine investments, far less than the number of States or congressional districts or whatever? Then it is a very, very difficult political problem to figure out exactly how these funds are to be allocated and that is a problem which I can offer very few solutions.

Mr. PRICE. Thank you, Mr. Chairman. I know we need to get on to the next panel.

AASHTO NEEDS SURVEY

Mr. CARR. Well, we do. Since you raised it, the book that we were referring to was put together with remarkable speed. As I looked at these projects—and I know quite a few of them in quite a few States—the reason why they are ready to go is they were going to be going anyway. That is why they are ready to go. They were on the assembly line or in the pipeline of projects planned for this country.

AASHTO is a wonderful organization. I think it would be better for us to have a study that shows of the available projects in the pipeline, which of those projects could be accelerated in a meaningful way. This doesn't really show that. And I think, with all due respect, in its aggregate, it is probably not as helpful as it might have been.

USE OF PENSION FUNDS FOR INFRASTRUCTURE INVESTMENT

I have one final question for you, and that has to do with the proposal that is floating around now using pension funds to finance infrastructure. Does anybody have a strong feeling on that and what it does in terms of displacement values and costs?

Dr. SCHWAB. It has not struck me as a great idea. To the extent that the returns from this infrastructure truly were greater than the returns that would be available in private investment, it would sound like a sound idea. But I don't see any evidence at all to that effect. I would think the best source of investment funds are typically State and local tax dollars.

If these benefits are truly large, so large, that they are so much greater than the cost, then the question would be why State and local governments are unwilling to undertake them.

Mr. CARR. Dr. Penner, any comments?

Dr. PENNER. I am somewhat skeptical of the idea, though I don't want to claim to be an expert on regulations that may now artificially inhibit such investments. But the proposals don't involve, to my understanding, actually forcing them to invest. That would be a very bad idea, obviously.

I think they are more about relaxing regulations and there are just a fixed amount of capital in the economy if the pension funds put their money into infrastructure, obviously, then there will have to be some other money going into other purely private investments.

Mr. CARR. In the end, you would have to have a commensurate risk in rate of return vis-a-vis other things which might be more expensive than the way we are funding it now. Agree or disagree?

Dr. PENNER. That is right, certainly.

Mr. CARR. Mr. Bernstein?

Mr. BERNSTEIN. I was going to say I tend to agree with Dr. Penner. As long as it is voluntary, those risk and reward decisions, if made available, would be up to the pension funds to decide.

Mr. CARR. Well, in closing, I want to thank all of you. I want to remind everybody—oh, my good friend and colleague, Frank Wolf. I am sorry, I guess I was——

Mr. WOLF. I just walked in.

Mr. CARR. I didn't see you come in.

Mr. Wolf. I want to apologize to the panel for not being here. I was at the CIA. They had a memorial service in my congressional district, for the victims of the recent shooting. I want to thank the witnesses for being here. Thank you, Bob.

Mr. Carr. Thank you. I want to thank you and remind you and all of our guests today that something that you will hear me say quite a few times by way of explanation of what our Committee does vis-a-vis the authorization committees. We have the Intermodal Surface Transportation Efficiency Act, and everybody talks intermodal, but there is only one intermodal transportation committee in this Congress and that is this subcommittee and our counterparts in the Senate.

Therein lies yet an additional layer of complexity as we have to measure not only highways, transit and aviation but rail and maritime as well. Thank you for being here.

Thursday, February 4, 1993.

INFRASTRUCTURE, INVESTMENT AND ECONOMIC DEVELOPMENT

WITNESSES

DR. DAVID ASCHAUER, PROFESSOR, BATES COLLEGE

DR. HEYWOOD T. SANDERS, DEPARTMENT OF URBAN STUDIES, TRINITY UNIVERSITY

DR. JOHN TAYLOR, PROFESSOR OF MARKETING, WAYNE STATE UNIVERSITY

DR. PETER RUANE, PRESIDENT, AMERICAN ROAD AND TRANSPORTATION BUILDERS ASSOCIATION

INTRODUCTION OF SECOND PANEL

Mr. Carr. I would like to welcome our 11 o'clock panel at 11:28. My apologies to you. No one should derive some political message from this panel other than that we thought it would help expedite the proceedings.

I would like to welcome Dr. David Aschauer, professor at Bates College, well-known theorein in transportation infrastructure matters; and Dr. Heywood Sanders, whose readings I have read with great interest over a number of years. I am particularly delighted to have, from my State, Dr. John Taylor, who is a professor of marketing at Wayne State University in Detroit and who also happens to be a constituent. But before anybody draws an unfavorable correlation between Dr. Taylor's appearance here and his being a constituent, I want to assure everyone it is almost entirely by accident. I noted in the newspaper that Dr. Taylor had been appointed to the—help me out.

Dr. Taylor. To the Commission on Intermodal Transportation.

Mr. Carr. The Commission on Intermodal Transportation, and he is from my district and I said here is a fellow who was right under my nose, and I was sorry I hadn't met him. In the last nine months or so we have had many constructive talks and I thank you for taking time to be here.

And, of course, my old friend, Peter Ruane, who has helped all of us in this community on thinking and trying to move the infrastructure needs of our country together as President of the American Road and Transportation Builders Association.

Welcome to all of you. We would like to hear from you Dr. Aschauer.

STATEMENT OF DR. DAVID ASCHAUER

Dr. ASCHAUER. Thank you, Mr. Chairman. I thank the Committee for this opportunity to express my views on, I would emphasize, the long-term impacts of infrastructure spending. I would like to have been here earlier to have heard the previous testimony, and I hope there is not too much redundancy or lack of recognition of the views of others, but I was unable to come to Washington until this morning.

Today I would like to briefly provide the committee with my current views on two basic questions. First, should we at this present time be increasing public investment spending? If the answer of that question is yes, should we expect that the public investment program we pursue will grow the economy enough to reduce the budget deficit?

In previous testimony, I have discussed my findings regarding the impact of infrastructure spending on the long-term growth performance of the economy. My own work gives some empirical support to the contention the significant fall-off in infrastructure spending, which we experienced during the 1970s and early 1980s, did contribute to our macroeconomic difficulties of the past two decades.

Specifically, my estimates indicate that if the fall-off in public investment that we actually experienced during the last two decades had not occurred, the return to private capital—and here I am looking at nonfinancial corporate capital, investment capital in equipment and structures—the return to private capital would have been nearly 2 percentage points higher than it actually was: A 10 percent profit rate, if you will, as opposed to an 8 percent profit rate.

Second, the growth rate of the private capital stock in investment, private investment variable, would have been nearly 1 percent per year higher, ranging around 4 percent per year rather than the actual 3 percent per year. I think from the perspective of international competitiveness, most importantly, the growth rate of labor productivity might have been some 40 to 50 percent higher. That is to say, growing at a 2.1 percent per year rather than the actual 1.4 percent.

No doubt as you have heard this morning, there has been a lot of controversy about these original results in my research. You have heard from Charles Hulten and Bob Schwab from the University of Maryland, who have found little influence of public capital on productivity growth when they looked at the data put out at the regional level. I want to say, at the same time, there are others, such as Catherine Morrison and Amy Schwartz at Tufts University, who used similar data, and find significant impacts of public capital on reduction of costs to business.

I think it is fair to say that the broad consensus of economists who have looked at the evidence is that infrastructure is important to the private economy. I remain of the opinion that wise infrastructure spending can offer economic returns substantially above the returns to private investments. Recent research by others, such as John Fernald of Harvard University; H.J. Brumn of the GAO, the Office of the Chief Economist at GAO; and David Canning and Marianne Fay of Columbia University found results which are supportive of my original findings—the magnitude of my original findings.

Yesterday, I received a paper by a professor at the University of Iowa who is using what we call a new growth theory framework to see what sorts of government policies have been pursued in the past, fiscal and monetary policies, and which have had a permanent effect on the growth rate of the economy. He looks at six different sorts of policies, including monetary policy and public consumption spending, and he finds that of those six, only public investment has had a clearly discernible positive effect on long-term economic growth.

I would think that there is enough evidence to substantiate the claim of extraordinary returns, at least at the macro level to public investment spending. Having said that, though, for policy purposes, and recognizing that resources are scarce, I am willing to take the position the returns to infrastructure investments are not super normal, rather only normal, in the same range as those of private investment in plant and equipment.

Taking this conservative, what I would call a conservative position on the issues, does not deny the importance of trends in public infrastructure, I believe, for our past economic performance. The growth in the public capital stock slumped from 4.3 percent a year in the 1960s to 1.7 percent in the 1970s and 1980s.

A straightforward growth accounting exercise using those numbers implies the drop-off in public spending can be held responsible for nearly 20 percent of the reduction in the productivity growth rate we had over the past two decades.

I would also want to say the typical public investment spending is not the same thing as the usual private sector investment; that there is evidence that indicates public and private capital work together in the production process rather than at cross purposes. So it is not enough to encourage private investment through investment tax credits or accelerated depreciation and so forth without a tandem increase in public investment spending if we want to maximize the economic gains from an overall investment strategy.

These arguments would support an increase in public infrastructure spending at this time. I would note, however, that even if investment spending can be rationalized, it may well be the case such spending will work against the goal of deficit reduction in the short and long run.

I have undertaken some analysis, using a modified WEFA macroeconometric forecast model, using some of these supply side effects of public investment spending, and looked at it in some detail in a back-of-the-envelope calculation, to make the point that it is highly unlikely that even if public investment can be rationalized on the grounds of yielding returns higher than those of private investment, it is highly unlikely we would see reductions in the deficit.

For example, if we assumed a 6 percent average interest rate on Treasury debt, an increase in the deficit today of $10 billion in order to finance an increase in public investment would involve an annual cost to the Treasury in the amount of approximately $600 million in the future to service the debt.

In the simplest case, the gain to the Treasury in the form of added tax revenues will depend on the average marginal tax rate and on the degree to which the resources for the public investment are coming out of whole consumption versus total private investment.

Assuming that the returns to public and private investments are equal, that is my assumption earlier, that the average marginal tax rate is 20 percent, and that the resources devoted to public investment come from private investment, full crowding out, if you will, the average annual gain to the Treasury in higher tax revenues would amount to approximately $180 million. So the future deficits would rise in the amount of $420 million per year.

Under the most advantageous set of assumptions, it is conceivable that added public investment could grow the economy enough to reduce the budget deficit. But even taking my original numbers as an accurate gauge of the effects of public capital on the economy, it is highly unlikely that there would be enough economic growth to see a future reduction. I might argue a policy which involves tackling both the public investment deficit and the budget deficit almost necessarily devolves into a policy that involves either a shift in public expenditures away from consumption activities into investment activities, perhaps further defense cuts shifted toward infrastructure investment or an increase in taxes. In short, there is no free lunch to be found in infrastructure spending, even if the infrastructure investments are yielding extraordinary returns.

I want to conclude by noting these hearings, I thought, were called to hear testimony on infrastructure spending as part of a short-run stimulus program. I take the view that all public investment projects should be rationalized on the basis of their contribution to the long-run growth performance of the economy.

I would agree with Dr. Penner and others that, in my opinion, history shows countercyclical fiscal policy to have been largely unsuccessful. Present evidence on the stay of the economy—substantial improvement in the housing sector and car sales, and the recent improvement in the index of leading indicators—suggests that fiscal stimulus is unnecessary and, if pursued for its own sake, likely to be counterproductive.

So while I can easily subscribe to the notion there are $10 to $15 billion of worthwhile public investment projects, and that such spending, which amounts to one quarter of 1 percent of GDP, stands little chance of overheating the economy, I cannot subscribe the economy needs $50 billion at the present time.

Thank you.

Mr. CARR. Thank you very much Dr. Aschauer.

[The prepared statement of Dr. Aschauer follows:]

Infrastructure Based Economic Stimulus

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U.S. House of Representatives
Committee on Appropriations
February 4, 1993

I thank the Committee for this opportunity to express my views on the long term economic impact of transportation and infrastructure related spending. I apologize for not being present to hear the witnesses earlier today, but I was unable to come to Washington until this morning.

Today I want to provide the Committee with my answers to two basic questions:

> should we increase public infrastructure investment?
>
> And, if so, should we expect that public investment will "grow the economy" enough to reduce the budget deficit?

In previous testimony, I have discussed my findings regarding the impact of infrastructure investment on the long term performance of the economy. My work gives empirical support to the contention that the significant fall-off in infrastructure spending during the 1970's and 1980's contributed to our macroeconomic difficulties of the past two decades. Specifically, my estimates indicate that if the fall-off in public investment had not occurred

> the returns to private capital (equipment and structures) would have been nearly two percentage points higher (a 10% profit rate instead of 8%);
>
> the growth rate of the private capital stock would have been nearly 1% per year higher (4% per year rather than 3%)

and, most importantly

> the growth rate of labor productivity might have been 40 to 50% higher (at 2.1% per year rather than 1.4%).

Over the past couple of years, there has been considerable controversy about these results. You have heard from Charles Hulten and Robert Schwab of the University, who find little influence of public capital on productivity growth at the regional level. Others, such as Catherine Morrison and Amy Schwartz--using similar data--find significant impacts of public capital on productivity.

I think it is fair to say that the broad consensus of economists who have looked at the evidence is that infrastructure investment is important to the private economy. I remain of the opinion that wise infrastructure spending can offer economic returns substantially above the returns to private investments. Recent research by others such as John Fernald of Harvard University, H.J. Brumn of the GAO, and David Canning and Marianne Fay of Columbia University is supportive of my own findings.

Still, I am willing to take the position that the returns to infrastructure investments are not "super-normal" but only normal, in the same range as returns to private investments in plant and equipment.

This hardly denies the importance of trends in public infrastructure investment for our past economic performance. The growth in the public capital stock slumped from 4.3% a year in the 1960's to 1.7% in the 1970's and 80's. A straightforward growth accounting calculation implies that this drop-off can be held responsible for nearly 20% of the reduction in productivity growth over the past two decades--even under what I feel to be the rather conservative assumption of equal returns to public and private capital.

Furthermore, the typical public infrastructure investment is not the same thing as the usual private sector investment; the evidence indicates that public capital and private capital work together rather than at cross purposes. So it is not enough to encourage private investment through investment tax credits or accelerated depreciation. A symmetrical policy, one aimed at maximizing the economic gains from an overall pro-investment stance, would involve a parallel increase in public infrastructure spending.

These arguments would support an increase in public infrastructure spending. It should be noted, however, that even if public infrastructure investment can be rationalized on the above grounds, it may well be the case that such spending will work against the goal of deficit reduction in both the short and the long run. A back-of-the-envelope calculation makes the point. Assuming a six percent average interest rate on Treasury debt, an increase in the deficit of 10 billion dollars to finance an increase in public investment will involve an annual cost to the Treasury in the amount of approximately 600 million dollars. In the simplest case, the gain to the Treasury in the form of added tax revenues will depend on the average marginal tax rate and on the degree to which the resources for the public investment come out of private consumption rather than private investment. Assuming that the returns to public and private investments are equal, that the average marginal tax rate is 20%, and that the resources devoted to public investment come from private investment, the average annual gain to the Treasury in higher tax revenues would amount to approximately 180 million dollars. Thus, the future deficits would rise in the amount of 420 million dollars per year.

Under the most heroic set of assumptions it is conceivable that added public investment could "grow the economy" enough to reduce the budget deficit. But this result is highly unlikely, even if the public investments contribute substantially to economic growth. Consequently, a policy which involves tackling both the public investment deficit and the budget deficit almost necessarily devolves into a policy which requires either

> a shift of public expenditures from consumption to investment (perhaps further defense cuts shifted toward infrastructure investment)

or

> an increase in taxes.

I conclude by noting that these hearings were called to hear testimony on infrastructure spending as part of a short run stimulus program. I take the view that all public investment projects should be rationalized on the basis of their contribution to the long term growth performance of the economy. In my opinion, history shows countercyclical fiscal policy to have been largely unsuccessful. And present evidence on the state of economy--substantial improvement in the housing sector and in the index of leading indicators--suggests that fiscal stimulus is unnecessary and, if pursued for its own sake, likely to be counterproductive. So, while I can easily subscribe to the notion that there are 15 billion dollars of worthwhile public investment projects and that such spending--at about 1/4 of 1 percent of GDP--stands little chance of overheating the economy, I cannot subscribe to the idea that the economy needs 50 billion in additional spending at the present time.

Mr. CARR. Our next witness is Dr. Sanders.

STATEMENT OF DR. HEYWOOD SANDERS

Mr. SANDERS. Thank you, Mr. Chairman. If I might, a brief personal note. Unlike a good many of the folks you have heard from this morning, I am not an economist, I am a political scientist. I, therefore, tend to look at these things in a quite different way.

Over the last 12 years I have been actively researching on the politics of infrastructure at the local level. I suspect I would have been much happier had I been able to sit in my office merely constructing econometric models rather than digging in the basements of city halls and spending hours trying to track down city council members to find out why and how they cared about getting potholes fixed in their districts. So my perspective is likely to be somewhat different.

Mr. CARR. Good.

Dr. SANDERS. Let me briefly review a few points about this and see if I can address some of the questions you raised earlier this morning about both a stimulus package and some long-term questions again from a more political and economic perspective. Again when I started this 12 years ago no one had any idea what infrastructure meant. We might well be better off if they didn't.

Infrastructure is a very peculiar thing, almost infinitely expandable to whatever someone decides is meritorious and worthy of including under a rubric that now appeals to the public sector and to the populace as well.

We talk about things as infrastructure that, in reality, are terribly different and, indeed, as you noted, fall under the jurisdiction of a vast host of committees on the Hill and agencies down the street. Those programs and functions at the State and local level look differently and behave differently and are affected by a whole variety of different policies.

It is difficult, for example, to lump water supply and the development of sewage collection systems together with highways and bridge repairs and to call that infrastructure and assume that it behaves in the same way. All of the evidence we have on spending and fiscal choices and, indeed, on the delivery system at the State and local level suggests that they don't behave in the same way. They are driven by different kinds of politics and different sorts of fiscal concerns.

Secondly, when we take a look at that big broad category of infrastructure, what we have to recognize is that, again, at the State and local level there is an enormous disparate, a crazy quilt, if you will, of local responsibility for things. The result is we have widely differing needs and characteristics in any given community.

We might well find one city that takes imminently reasonable care of its streets and yet has a problem with its public transit system; another that has invested millions in taking care of its sewers and wastewater treatment systems and faces some problem in its streets.

If I might, one very brief political note. One of the first cities I began to visit early in the 1980s was Cleveland. My colleagues from the Urban Institute had been there not very long before and they expressed some amazement that Cleveland managed to keep its records on street resurfacing in this odd sort of way. They listed them year by year for each of the city's wards. My eyes lit up. It was clear to me that information is kept that way for a very obvious reason. In Cleveland, residential streets were taken care of because local city council members derived enormous political credit and success from taking care of the streets of their constituents. Politics drove that in Cleveland and that makes an enormous amount of sense.

It also meant that big arterial streets in Cleveland were in lousy shape because they didn't belong to anybody and the mayor only managed to take care of streets downtown on his own. There were very few folks interested in them. The result was that even in the midst of a fiscal crisis about as severe as any American city has faced, Cleveland was devoting millions of its dollars and millions of federal dollars as well annually to resurfacing streets.

Those residential streets, particularly those in the most prominent and politically successful wards had been terribly well taken care of. The city's bridges may well be allowed to fall into the appropriate rivers and ravines but those streets would get taken care of. That is the way the political system works at the local level. I am sure I don't have to remind you of that.

But it does mean that simply pouring money into any function or activity or grant program at the federal level or local doesn't necessarily mean you get out at the other end what you anticipate.

The other thing at the local and State levels that we found intriguing is that for years and, particularly in recent years, we have seen numbers of needs, numbers of needs generated by the Federal Highway Administration and by EPA, by a variety of national organizations and associations. We invariably are told we are falling behind in meeting those needs. I have sat and gone through city capital budgets and fiscal projections dating back to the 1940s. I can never find a single occasion where any public official has announced publicly, in word or writing or in deed, that somehow the city is meeting every one of its self-proclaimed and announced needs.

Invariably what happens is needs are not met. Actual spending falls far below what needs are seen to be, whether it be in 1946 or 1948 or 1988.

Spending by State and local governments operates in a very peculiar environment, one quite different from the world of constant dollars that the economists often talk about; certainly different from the one denominated by our growing gross domestic product. Revenues and dollars for infrastructure, or anything else, are raised with some difficulty. Particularly when we look at the so-called shortfall in infrastructure spending in the 1970s and early 1980s, what we find is, simply, particularly in the highway area, that State governments lagged behind the inflation rate and faced the need to raise taxes, particularly fixed gasoline tax rates, in order to catch up.

They did so in some States with some reluctance, some States performed better than others. But raising taxes and generating money for the public sector is not an easy business, and that means we are constantly forced to make choices, not only here but west of the Potomac as well.

The result, in terms of outcomes, is a pattern that is often marked by some very obvious sets of political choices. States, counties and cities have to pick and choose what they are going to spend money on. They may well pick and choose to spend money on infrastructure or on a piece of something that we can label infrastructure. They may well also choose to spend their money on other things.

I have argued in some other places that it is terribly intriguing that we often find some cities doing far less in terms of capital investment these days in the last ten years, than they have done historically. In those cities they have obviously chosen, for one reason or another, to make reducing taxes, reducing revenue generation, a far more serious political choice than in others.

At the same time, what we often find is States, counties and city governments that choose to put investments in some places rather than the others. That is a choice that they choose—that Atlanta or Cleveland, or my hometown of San Antonio, chooses to build a dome stadium or a public arena or a convention center expansion and chooses not to fix up its local streets doesn't necessarily mean that they have got an infrastructure problem.

What it means is that they have chosen to invest their money in a somewhat different way, perhaps one that I or the committee might not approve, but certainly a choice that was made locally.

If I might just take a very brief time period and address a couple of your questions about the short-run stimulus package. We have in the case of what Dr. Penner mentioned, the local public works program, rounds one and two, that were begun at the tail end of the Ford administration and then under the Carter administration, a quite plausible analog to what large-scale stimulus efforts are likely to do in this country. They tend to come on line late, and that is, it often takes, in the case of LPW-2, a good six months before a legislative proposal was signed by the President; a full nine months before projects were committed.

Even with the 90 day start time requirement that was made part of LPW-2, an enormous delay in getting money out. That is the nature of stimulus packages. They tend to be slow.

There is a big job of allocating and finding money. They also have some perverse effects. For example, as you mentioned in the case of those, the study of Ready-To-Go projects that AASHTO did, it is quite likely that many of the projects that would be funded by a stimulus package are in the pipeline to be funded already; that is, we may move them ahead a little bit, but we are not necessarily spending entirely new dollars.

The analyses of gross substitution for the LPW program talked about substitution, that is federal dollars substituting for local ones, on the order of about 25 percent. If we require local matching as the President and his advisers have suggested, we have some ways of reducing that, but we also have some terribly peculiar effects as well. For example, in a number of the local projects that have been documented in the two volumes prepared by the U.S. Conference of Mayors, on their Ready-To-Go Urban Public Works projects, what we find are lots of local, for example, bridge projects that are going to be funded under the highway bridge replacement and rehab program with 80 percent federal dollars.

To talk about a stimulus package that provides federal dollars at a lower match rate is likely to simply let those bridge projects sit. We provide federal dollars at a higher match rate than 80 percent, say the 100 percent rate of LPW in the mid-1970s, and what we are likely to do is simply pick up merely the extra 20 percent that was the local share.

It is not clear in cases like that that we get much oomph in the short term. On the other hand, we find cities and States will probably go ahead and do what they were going to do anyway, merely pushing their spending efforts ahead a little bit. In the long-term sense let me mention a couple of quick things that make sense.

We do have some infrastructure problems in this country. I really would like to see them fixed. The way we are going to get them fixed is by structuring federal policy, and we have come a long way in the last two years in doing that, so that we provide incentives to States and local governments to fix infrastructure and then take care of it, and not to continue invest in the far more politically rewarding, at least in the short-term business, of sustaining local economic development.

It is a terribly perverse outcome that the recipients of federal dollars often find it better to build new highways and build new bridges and other new public facilities in an effort to lure new jobs and lure new industry and gain the political advantage posed by stimulating local private economies rather than investing in maintaining and upgrading and renewing what we already have.

There is a great deal of evidence to suggest that is where we get the best bang for the buck and that is how federal policy ought to be structured.

We also ought to structure those incentives so that we encourage States to fix what they have got in a more consistent way. We have seen over and over, as your colleague from Texas mentioned before he had to leave, that things like our bridge problems and our problems of poor pavement are terribly concentrated often at the local rather than the State level and on highways that are local rather than State responsibilities.

Mr. CARR. Thank you, Dr. Sanders.

[A biographical sketch of Dr. Sanders and an excerpt entitled "What Infrastructure Crisis?" by Dr. Sanders from "The Public Interest" (number 10, winter 1993) follows:]

BIOGRAPHICAL SKETCH

HEYWOOD T. SANDERS

Heywood Sanders is Professor of Urban Studies at Trinity University, San Antonio, Texas. In addition to his current position, he has taught at Brown University and the University of Illinois. He has a BA from Johns Hopkins University and a PhD in Government from Harvard University. His publications include The Politics of Urban Development (with Clarence Stone) and Urban Texas: Politics and Development (with Char Miller), in addition to numerous articles and papers on urban politics, urban revitalization, economic development, and local fiscal policy. His work on urban infrastructure politics began some 12 years ago under a grant from the Twentieth Century Fund. He is currently completing a book manuscript on urban infrastructure and capital investment in the U. S. since 1945.

What infrastructure crisis?

HEYWOOD T. SANDERS

JUST A FEW years ago, the term "infrastructure" held little meaning for most people. Today citizens and policymakers alike increasingly subscribe to the notion that we suffer from an "infrastructure crisis," marked by deteriorating highways, bridges, and sewers. News stories regularly describe an infrastructure that is "rotting," "crumbling," or "collapsing." This conclusion is bolstered by historical and international comparisons of capital-investment spending, which ostensibly demonstrate a persistent national failure to invest in public works. Meanwhile, the recent recession has added urgency to calls for a massive effort to boost public capital spending, create new jobs, and restore our infrastructure to its previous glory. President-elect Clinton's plan for "Putting People First" calls for spending an additional $20 billion a year on everything from rebuilding highways to constructing high-speed rail lines. And the nation's mayors have identified more than $26 billion in immediate public works projects to help lead cities and the nation out of recession.

But while visions of greater economic competitiveness and a new WPA hold increasing political appeal, this idea of a vast and pervasive national infrastructure crisis has been built on very few statistics and a number of myths. America's public works are not falling apart. To be sure, public works did suffer from a spending decline in the 1970s. And some localities (and an occasional state) appear to face real problems of physical decay and deterioration. However, the root causes of these problems, even in many of our worst-off cities, are largely political rather than fiscal or economic.

The myth of declining spending

According to many reports, we are simply not spending enough on public works, in part because infrastructure ranks low on the priority lists of politicians. This "underspending" is often stated relative to spending in other industrialized countries, or to the value of our gross domestic product. But appropriate comparisons must adjust for differences across nations in the size and content of the public sector, and for the role and function of different types of infrastructure as well. When we make these adjustments, the underspending myth becomes evident.

The basic categories of infrastructure are highways and streets, water systems and supply, and sewer systems and wastewater treatment. Spending on these categories is almost entirely an activity of state and local governments, although federal grant assistance accounts for a substantial share of state and local spending. In terms of capital spending, the first category—highways and streets—is by far the largest, amounting to almost $26 billion of state and local spending in 1991 (this figure and all others in this section are expressed in 1987 dollars). Highway capital spending dwarfs spending on sewers ($8.32 billion) and water ($5.75 billion), as well as mass transit ($1.70 billion), according to figures from the Department of Commerce.

The trends in capital spending for these categories of basic infrastructure are quite clear, and contradict arguments about public inattention and government failure. Highway spending boomed during the 1960s, as we built the Interstate Highway System with federal grant funds. Then spending slipped during the 1970s, as revenues from gasoline taxes—by then the principal source of highway spending—failed to keep up with inflation. But from a low point of about $17 billion in 1981, state and local highway investment increased regularly for nine straight years. The preliminary figure of $25.3 billion for 1991 represents a modest drop from the $26.7 billion of 1990. But the figures for 1990 and 1991 are just about equal to the annual average for the 1960s, the period of the great national investment in the Interstate Highway System, and spending will continue to increase over the next few years. Indeed, highway spending for the first half of 1992 proceeded at an annual rate of more than $29 billion. Even greater federal highway spending will be fueled by the new Intermodal Surface Transportation Efficiency Act, and state spending will be buoyed by a host of increases in state gasoline taxes enacted over the last few years.

The spending trends for the other two categories, water and sewer systems, tell a similar story. State and local capital investment for sewer systems boomed during the early 1970s with a boost from federal grants under the Clean Water Act. The postwar spending peak came in 1975, with just over $9 billion in capital investment. Then spending dropped off as federal aid declined in the early 1980s. Yet in 1991, spending on sewers reached $8.32 billion, just under the postwar peak. As with highways, spending has notably increased since 1985, notwithstanding a decrease in federal aid.

Capital investment for water systems has also moved steadily upward over the last decade. Spending in 1991 came to $5.75 billion, the highest annual expenditure in the nation's history. Public investment for water supply and distribution in 1991 was more than twice the annual spending of the early 1970s, even after adjusting for inflation.

Beyond the three basic infrastructure categories, spending on mass transit is the one clear exception to the pattern of steady long-term increases in infrastructure investment. Mass-transit facility spending through the 1980s has fluctuated from year to year, averaging about $1.5 billion (still considerably higher than the annual average of $750 million during the 1960s). But in the last four years, even mass transit has shown regular increases, with 1991 spending totalling $1.7 billion. State and local capital spending on airports, moreover, has been on the increase since 1982. Spending in 1991 amounted to $2.54 billion, just under the nation's historical peak in 1990 ($2.64 billion) and a

37-percent increase over spending in 1970. The amounts spent on both mass transit and airports are, of course, dwarfed by highway spending.

These spending trends belie the notion that we are underinvesting or living on the investments of past generations. Led by sharp increases in highway investment, spending has gone up in the last decade and shows every sign of continuing to rise. Total investment in streets, highways, mass transit, airports, and water and sewer systems came to $43.66 billion in 1991, a figure that is 41 percent above the 1982 low point in capital spending.

In two of the three basic infrastructure categories, spending has also kept pace with the growth rate in population. The 1991 ratio of capital investment for water systems to population size is just under the ratio for the peak postwar spending year of 1968. And for sewers and wastewater treatment, population-adjusted spending in 1991 exceeded the average annual spending of the 1970s, the historical high point for sewer-system investment. It is only for highways that capital spending lags on a per capita basis. There, state and local investment has yet to meet the peak levels of the mid-1960s, although it has been steadily increasing.

Some recent analyses of infrastructure spending have pointed to a spending decline relative to total federal spending or to the nation's gross domestic product. Using either of these measures, infrastructure spending, particularly on highways, has indeed declined from its peak years in the mid-1960s, although comparisons with overall federal spending are complicated by the enormous growth in Social Security and Medicare outlays. But past spending history should not necessarily dictate spending today or in the future. The spending boom of the 1960s reflected a national investment in the creation of the Interstate Highway System and new suburban development. Today it is far from clear that the nation should again spend the amount of money required to build more than 40,000 miles of new highways; repairing existing highways is a different—and far less expensive—undertaking.

Recent patterns of infrastructure investment suggest that public officials and voters are quite capable of recognizing the importance of maintaining streets and sewers, and of supporting new taxes and spending for them. Twenty-two states increased their gasoline tax rates between 1989 and 1991 to support highway investment. California, long bedeviled by taxation and spending issues, saw the public approve a referendum providing for regular annual gas tax increases to 1994. In fact, even without a vast national campaign to rebuild the infrastructure or to spur state and local government infrastructure investment, these governments are doing just that. And by raising gasoline tax rates and sewer fees, and promoting bond issues for airport expansion and development, state and local governments are providing new and larger revenue streams for future infrastructure-spending increases.

Not a federal case

The second infrastructure myth is that we face a pervasive, national problem that requires a solution at the federal level. The reality is quite different. Take the widely reported case of national bridge problems. As of mid-1990, according to the Federal Highway Administration (FHWA), there were almost 276,000 bridges on the federal-aid highway system, the backbone of our highway and street system. About 13 percent of those bridges were classified as "structurally deficient," meaning that they require reduced loads, restricted traffic, or immediate rehabilitation. These are the nation's real "problem bridges." Another 18 percent were deemed "functionally obsolete," a classification that includes those that do not meet current standards for lane width or for the curve of highway approach. These obsolete spans might warrant renewal or replacement, but they are not substantial safety or structural risks, so it seems appropriate to focus on the deficient-bridge category.

The 36,742 structurally deficient bridges do represent a real infrastructure need. But that need is not distributed evenly across the country. Fully 40 percent of the deficient federal-aid-system bridges are located in just six states. The worst four states account for more than 11,500 bridges, or 31.4 percent of the national total. For the great majority of states, bridge problems are fairly modest in scope.

Although the average incidence of structurally deficient bridges nationally is 13 percent, 24 percent of federal-aid bridges in Missouri are deficient, while West Virginia hits 34.5 percent. New York state leads the nation with fully 55.7 percent of its almost 9,000 bridges deemed deficient. Clearly, bridge needs are very different across the states.

Individual states are responsible for most of their own bridge and highway maintenance, and some are doing a good job. Only 2 percent of Florida's bridges are deficient, and the figure for Oregon is 5.5 percent. Even in states with severe winter weather and problems caused by road salt—Minnesota (10.7 percent) and Maine (12 percent), for example—real structural problems are relatively modest. Yet other states, like New York and West Virginia, lag far behind national norms.

This uneven distribution is mirrored in other highway needs, such as pavement condition. According to 1989 data, the average percentage of "poor" quality roads across the states is 11 percent. In most states the problem is relatively small. For example, only 5 percent of highway pavement in Texas is in poor condition, and the proportion for Connecticut is only 3.6 percent. For other states, like Massachusetts (10.1 percent) or Michigan (10.8 percent) the needs approximate the national average. But a handful of states stand out with unusually poor roads. The "poor" percentage for Rhode Island is 26.8, while Idaho stands at 27.7 percent and Mississippi measures 22.9 percent. As with bridges, a small number of states look much worse than their counterparts, and these differences do not appear to correspond directly to varying weather conditions. A major federal spending program would obviously help a few poorly managed states, but only at the expense of others that have done a good job of maintaining their own bridges and highways.

Inexpensive repairs

A third great infrastructure myth is that it will cost huge sums of money to fix our "crumbling" infrastructure. Needs estimates during the 1980s from groups like the Associated General Contractors of America were often in the trillions of dollars, reflecting the cost of replacing thousands of bridges and a large portion of our street, highway, and sewer systems. These estimates tend to impress by their very scale, and may well have played a role in stimulating the increasing federal, state, and local capital investment of the last decade. Yet large cost estimates can conceal as much as they reveal, muddying safety problems with higher design standards, or including the "wish lists" of local officials along with vital needs.

Take the case of recent needs estimates for bridges and highways. The Federal Highway Administration's longstanding estimate of $51 billion to meet our national bridge needs has been widely reported in the media. But that figure covers a wide range of needs across all the states. Divided into some specific categories that reflect both governmental responsibility and immediacy, the $51 billion total looks a bit more tractable.

First, very little of this total involves structures on the Interstate Highway System, the most vital national transportation system with the greatest vehicle traffic. Interstate bridge needs come to only $3.5 billion—quite a manageable amount at a time when federal highway spending alone comes to more than $16 billion annually.

Indeed, the repair cost for structurally deficient bridges on the entire federal-aid highway system comes to only $19.1 billion. Recall that these deficient bridges represent the real "problem" category of potential safety difficulties. Another $12 billion of the total bridge-needs estimate is made up of "functionally obsolete" spans on the federal-aid system. These bridges may not meet contemporary standards, but they can often be improved (with better signs and markings, for example) at far less than the total cost of physical rehabilitation or repair. Finally, about $20 billion of the need total comes from bridges off the federal highway system. The quality of these bridges varies widely from state to state, as does the traffic they carry. In many cases, these bridges are the remnants of an earlier rural highway demand, and some proportion could be posted for reduced loads or actually abandoned with only modest public inconvenience.

While the $51 billion figure is impressive, we can probably manage our real problems for half that amount. And if bridges constitute a clear investment priority, current levels of capital spending by state and local governments are great enough to meet that amount over a few years. Part of the difficulty in assessing infrastructure need, however, is that "need" is a moving target, reflecting not only structural conditions (the "crumbling" and "decaying" that usually preface the term "infrastructure") but also changing definitions and preferences.

What is "need"?

Consider the most recent federal estimates for highway investment needs, completed in 1991. The FHWA's "improve 1989 condition and performance" model calls for eliminating a backlog of current highway deficiencies at a total cost of $400 billion. Annual spending would have to range between $60 and $68 billion per year, or almost three times current levels, to meet this total need. Yet 72 percent of the need amount reflects congestion and traffic-carrying capacity—the presumed requirement for continuing to add new lanes of highway to meet traffic demand. Only 28 percent of the spending would be devoted to improving or maintaining existing pavement quality. The "need" to add a vast number of new lanes of freeway and expressway, almost all in developed urban areas, generates an enormous figure for the purchase of land and right-of-way. In fact, many economists recognize that adding new lanes and new highways is about the least efficient way to deal with traffic demand at peak commuting times. Alternative pricing schemes or changes in commuting times and patterns could more effectively deal with rush-hour congestion. By lumping the massive cost of building new highways together with the more commonly understood issue of roadway quality, we can get an enormous "need" figure that is probably unnecessary and unattainable in the context of local highway politics.

The myth of vast infrastructure spending needs reflects not only national programs and policies, but local circumstances as well. Again, enormous needs in dollar terms can often be broken down into much more realistic assessments of required spending. One declining central city, St. Louis, provides just such an example.

A 1991 assessment of St. Louis' capital needs came up with a total of more than $239 million in spending requirements. With the city's existing capital spending coming to just over $8 million per year, the city would need some twenty-eight years to meet its current capital needs. Some of these needs reflect real short-term problems, such as replacement of underground storage tanks for $1 million and a new siren warning system. But other items reflect the city's failure to invest in maintenance and renewal for decades, like the $48.5 million item for renovating city parks. And other capital "needs" are simply wish-list projects that carry some political payoff, like $15 million required for economic-development projects and another project to develop a "multimodal passenger terminal" to link trains, buses, and light-rail systems in the downtown core. Indeed, the city's capital-need figure even includes $35 million for renovating curbs and alleys that have received essentially no city attention since they were first built. Such a "need" could be addressed simply by assessing property owners for the cost of repairs, as many other cities have done.

Financing infrastructure

One final myth of urban infrastructure, particularly current in recent months, is the notion that state and local governments are so strapped and constrained as to be incapable of meeting their own needs. This view of state and local incapacity has been particularly heightened by stories of declining government revenues and fiscal cutbacks in the wake of recession. States and localities do face a tough fiscal time today. But those fiscal problems do not necessarily limit capital spending and infrastructure investment.

As noted earlier, the figures on state and local capital spending in recent years show steady and regular increases. Those increases have largely continued through early 1992. This continued pattern of steady or rising capital investment in infrastructure, even in a recession, is understandable in light of the mechanisms for financing public works. Highway building, the major spending category, is principally financed through motor-fuel and vehicle taxes tied to car ownership and mileage, which are quite resistant to economic downturns. Water and sewer system investment is similarly financed through dedicated user fees that reflect water usage and that remain quite stable over time. And for many local governments, the bond issues that support infrastructure construction are tied to specific revenue sources independent of national economic conditions. Indeed, voters have proven quite supportive of infrastructure bond proposals even in recent months. St. Louis saw the passage of a $1.5 billion airport expansion plan in November 1991. And voters around the country approved more than 75 percent of all non-education bond proposals voted on in 1991, including 98 percent of the more than $2 billion in proposed transportation bonds. Thus, while sales and income tax revenues have dropped for many state and local governments, the fiscal capacity to finance capital investment has remained.

Bad choices

While many state and local governments have been boosting infrastructure-related revenues and spending, some governments have chosen to avoid higher taxes or new public debt. This avoidance of infrastructure funding has not been a product of the "tax revolt" or a lack of public interest. It has instead quite often been the result of a failure of political leadership and initiative, with mayors and governors content to promote the politics of job creation while avoiding mounting public needs. These locales have *chosen* not to use their resources to invest in meeting their own infrastructure needs.

Take the case of highway investment. The vast bulk of revenue for highway maintenance and capital spending comes from taxes on vehicles and fuel, amounting to 78 percent of state highway revenues in 1989. For decades, fixed gas tax rates and fees provided a stable source of revenues. But in the 1970s and beyond, inflation substantially eroded the revenues from these sources. The fiscal solution was simple—higher gas taxes, just to keep up with inflation. But while some states regularly raised tax rates, others fell far behind. Take the case of two states, Iowa and California, with exactly the same gas tax rate of 7 cents per gallon in 1966. Iowa boosted its tax in 1978, 1981, and again in 1985. Today, after additional increases, that gas tax rate is 20 cents per gallon. California first raised its tax—to 9 cents—in 1983, and now it stands at 16 cents per gallon, lagging well behind other states. Some state governments have managed to boost tax rates and invest in bridges and highways, despite the possible political fallout from tax increases. But many state governments let highway investment fall in relative terms, despite evidence of need. New York has maintained an 8-cent-per-gallon tax without change since 1973, while neighboring Connecticut imposes a 25-cent-per-gallon rate.

For most cities, substantial spending on infrastructure projects requires the use of long-term debt, spreading the cost of highways, streets, and sewer systems over twenty or thirty years. Debt financing commonly requires direct public approval through a vote to support a bond-issue proposal. While some locales like New York City have the capacity to issue debt without public approval, forty-two states require a vote. By approving a bond issue, the electorate also commits itself to the taxes required to repay it. Urban capital spending thus need not directly compete for local revenues with such immediate priorities as police protection or aid to the homeless.

Bond issues built the modern American city. In Chicago, for example, local voters faced a total of ninety-two individual bond proposals from 1910 through 1927, involving more than $230 million in new debt. That $230 million in bonds would translate into $1.8 billion in 1987 dollars. And the city's voters endorsed more than 85 percent of the value of these proposals, supporting more than $180 million in new bonds. It was this public support and the consequent investment that created the city's complex of boulevards and major avenues, built a new downtown bridge system, and paid for the development of North Michigan Avenue as a major business locale.

Bond votes provided the capacity for state and local governments to build and expand infrastructure through the 1950s and 1960s. The constant-dollar volume of state and local bond proposals on the ballot tracks the infrastructure-investment boom through the 1960s very closely, particularly when school spending is excluded. Although the annual volume would routinely increase in even, election years compared with non-election years, the overall trend was up during the first part of the post-World War II period. But after a peak of about $43 billion in 1968 (in 1987 dollars), the volume of bond proposals fell quite sharply during the 1970s.

Some of the decrease in proposed bond issues reflected changing political realities. The voters' mood changed in the early 1970s, and a far greater proportion of bond proposals were voted down. That shift presaged the "tax revolt" of the mid-1970s and the adoption of California's Proposition 13, for example. State and local elected officials no doubt responded to the public's aversion by avoiding new bond proposals. And an increasing volume of relatively unrestricted federal aid (under the revenue-sharing and Community Development Block Grant programs), as well as new assistance for sewage treatment and sewer systems, may well have offered elected officials an alternative source of capital-investment funds. The ultimate result was a dramatic drop in the volume of bond proposals on the ballot. That reduced level of voted proposals has continued in recent years. Thus in 1991, the voters faced a total of $6.66 billion in non-education bond proposals (in 1987 dollars) and approved 77 percent. The 1991 proposal amount was actually less than the volume in 1987 and even slightly less than the value of bond proposals in 1981. Most remarkably, after adjusting for inflation, the 1991 bond proposal amount was only 27 percent of the amount voted on in 1969.

Investment in infrastructure has long been tied to popular support. Today, the public's approval rate for new bond issues, particularly those for transportation infrastructure, continues to be substantial. What has changed is the set of investment choices that voters face. In city after city, bond proposals have all but disappeared from the ballot. Promoting bond issues and capital spending carries with it political risk, and the appearance of raising local taxes. Even though the level of state and local infrastructure investment has soared in recent years, the fiscal choices faced by the voters remain quite limited. The result has been a dramatic shift, both in what government builds and where it is built.

Spending in St. Louis

The shifting politics of local infrastructure investment can be readily seen in the case of an older central city like St. Louis. For decades, St. Louis financed its capital spending with bond issues approved by the voters. These paid for everything from a city auditorium and civic center to a new hospital, streets and highways, parks, and urban renewal. These bond issues translated into regular increases in the city's debt. The city's general obligation debt increased from $72 million in 1950 to $128 million in 1960 and almost $150 million in 1968 (all in nominal dollars). But the city gradually began to move away from capital spending during the 1970s. By 1980, its debt had fallen to $86 million. Adjusting for the impact of inflation, the drop was even more remarkable. In 1987 dollars, debt fell from $395 million in 1970 to $90 million in 1980. And during this period, the city's capital spending from its own fiscal resources effectively evaporated, falling to only $18 million by 1992 (again in 1987 dollars).

The general move away from bond proposals by many cities, beginning in the 1970s, was certainly evident in St. Louis. One major package of bonds totalling $110 million was largely defeated in 1974. The city's reluctance to address capital-spending needs continued well after that date and through the 1980s. Only two small bond proposals appeared on the ballot in the 1980s, for a police-communication system and fire stations. Both passed with more than the required two-thirds majority. The city's current debt amounts to only $18 million, compared to the $90 million of 1980 and the $575 million of 1960 (all in 1987 dollars).

The debt decline has also had a marked impact on property taxes. In past decades, new bond issues meant stable or increasing property taxes for bond repayment. But with no new bond issues, the city's property taxes have been dropping year by year, although the majority of the city's assessed value consists of commercial real estate that provides a solid tax base.

Convention centers, stadiums, and airports

The modest level of debt and infrastructure investment in contemporary St. Louis is only one part of the city's public spending story. The city has proven quite adept at financing and building certain projects in recent years. These projects just do not include streets and bridges.

The one major bond proposal that did reach the voters in recent years, as mentioned above, called for a $1.5 billion expansion of Lambert-St. Louis International Airport, a scheme promising the creation of thousands of new jobs and local economic growth. Despite an absence of detailed planning for the expansion project and much local debate, the city's voters provided a 64 percent majority in favor of the revenue bonds. The city is also in the process of developing two major new public facilities in the downtown business district. The city's convention center, originally approved by the voters in 1972 and opened in 1977, is currently being expanded at a cost of almost $120 million. The convention-center expansion is being financed by an independent public authority, neatly avoiding constraints on the city's spending (and the requirement for voter approval of bonds). Still, the city is obliged to spend almost $10 million per year under a lease arrangement.

Adjacent to the convention center, the city—along with the state and county—is financing and building a new domed stadium to serve a hoped-for National Football League team. The stadium project will cost another $245 million, with the city contributing $60 million. Once again, there was no public vote on the project, despite its roughly $6 million in annual lease payment cost to the city. Compared to St. Louis' current capital budget of $6.6 million, the annual spending for the dome and convention center represents an enormous fiscal commitment. St. Louis clearly has developed a kind of "two-track" system for funding capital investments. Some needs, like streets, bridges, and parks, have been consistently put on the back burner or ignored. Other capital projects—principally those targeted to attract tourists or boost the fortunes of the downtown core area—have received substantial support. These projects enjoy their own dedicated revenue sources, such as a restaurant-meals tax for the convention-center expansion, and are therefore not obliged to compete with other public needs.

The choice of convention centers, stadiums, and airports as public-spending priorities serves to aid local business interests and holds the promise of boosting economic growth. Moreover, it can be advantageous to a big city mayor (like St. Louis' Vincent Schoemel or former Atlanta mayor Andrew Young) who seeks to run for higher, statewide office with a record of low taxes and expansive new job creation. But it can also mean that other, longer-term needs are avoided or deferred.

St. Louis, like many other cities, undoubtedly has infrastructure needs and a host of other urban ills. But its funding choices reflect a political problem that would not necessarily be solved by a one-time infusion of federal dollars. Federal assistance would have to be filtered through the same local political system that has consistently sought to avoid bond proposals, limit voter review, constrain capital investment, and boost the economic fortunes of downtown. Indeed, when "no strings" federal revenue-sharing arrived in 1972, the city employed most of the new aid to substitute for city revenues in paying for the original development of the Cervantes Convention Center. When short-term federal assistance for local public works became available in 1977, city officials chose to build a pedestrian connection between the

Convention Center and downtown buildings, along with other public works.

The St. Louis case is not unique. Other major cities, including Atlanta, Kansas City, and Cleveland, have succeeded in avoiding new bond proposals and in limiting their capital investment. In Cleveland, the voters last faced a bond proposal on the ballot in 1969. The inevitable result has been a drop in real city debt and a mounting toll of infrastructure need, even as investment in economic development projects and convention centers has soared.

Chicago's recent flooding catastrophe provides an example of just this sort of policy mismatch. Even as the collapse of part of the downtown tunnel system serves as a symbol of aging infrastructure and presumed urban need, Chicago is embarking on the largest single public building project in its history, a plan to enlarge its McCormick Place convention facility by more than 60 percent, adding one million square feet of new exhibit space, with a total price tag of $987 million. Although some argue that the new McCormick Place will eventually pay for itself and generate thousands of new jobs in the city, construction will require new taxes on downtown restaurants, automobile rentals, and local hotel rooms, and a special airport departure fee.

State priorities

The relationship between infrastructure "need" and the question of political choice can also be seen in state spending decisions, where there is often a preference for new building and economic development. Take the case of Texas. The state reported almost 1,000 structurally deficient federal-aid bridges in 1990, and another 3,644 bridges were deemed "functionally obsolete." That leaves Texas with the second largest total of "bad bridges" in the nation, right behind New York. Yet Texas has ample resources of its own to invest in bridge renewal and repair. It has steadily raised its gasoline tax in recent years, from 5 cents a gallon in 1984 to 20 cents today. And in 1991 the state spent about $3 billion on highways, including almost $1.8 billion on new construction. These expenditures include millions for widening Interstate highways, double-decking freeways, and building entirely new roads (including one providing access to a new theme park in San Antonio). The state could clearly address—and solve—its bridge problems with its own resources if it chose.

There is no particular reason for Texas to renew or replace all those thousands of bridges which add to the national totals of "need." Many of them carry light traffic loads or serve limited areas. The "functionally obsolete" bridges may simply have narrow shoulders or be subject to occasional flooding of the roadway. Indeed, the state's preferences are clearly shown by the way it spent $568 million for maintenance in 1991. Bridge maintenance received merely one percent of the state's total maintenance spending. To build a national policy on the assumption that Texas should replace or renew all of its 4,635 troubled federal-aid-system structures makes little sense. Just as St. Louis chooses convention centers rather than parks or bridges, so states quite commonly choose new construction and expansion over renewal and rehabilitation. Sometimes this is appropriate; sometimes it is not.

Restructuring choices

Thus, the central issue in dealing with contemporary infrastructure needs is restructuring the choice process at the state and local levels, and encouraging all levels of government to invest seriously in reasonable renewal and rehabilitation efforts rather than in new development. Federal highway policy should begin to emphasize renewal and repair over new construction, rewarding those states that increase their own fiscal effort with greater federal aid. Aid for bridge replacement and renewal should also encourage state-level effort and attention, rather than promoting the perverse set of incentives whereby an ever-larger count of "bad" bridges helps states secure more federal aid. If some states can manage to care for their stock of bridges and highways, they should properly serve as national models and be supported by national investment policy. Federal policy should promote attention to real infrastructure needs. The contrast between rusting bridges and brand-new stadiums in cities like St. Louis and Atlanta starkly demonstrates that more dollars alone will not provide a solution to those infrastructure problems that do remain around the United States.

Mr. CARR. Dr. Taylor.

STATEMENT OF DR. JOHN TAYLOR

Dr. TAYLOR. Thank you, Mr. Chairman, and members of the Committee. I would like to start by just reiterating that the U.S. economy has become highly specialized and reliant on very reliable high speed transportation systems. Many of our problems are isolated to specific areas. Suburb-to-suburb commuting and package deliveries suffer from a great deal of congestion in some cities.

The transportation system increasingly is trying to deliver small packages and has relied on courier services and other kinds of local delivery systems that are increasingly reliant on intermodal kinds of transportation systems that work to increase customer service levels and reduce the cost of systems, and I am talking about rail, truck interfaces and aircraft and truck courier service kinds of interfaces.

Those before me have spoken aptly about the level of infrastructure investment that may be appropriate. Let me just say that my own view, after reviewing the literature, is that there is a weak positive impact on productivity and competitiveness that results from infrastructure investment, but, really, it is a question of what the opportunity costs are that come from that investment. And my own belief is that any substantial increase in energy or user taxes represents an opportunity cost and will have an adverse impact on competitiveness of the U.S. industry overall.

While it is true other countries have far higher energy taxes than the U.S., the long distances across the U.S. continent, and this high degree of specialization I speak about, means that an energy tax would have a far greater negative impact than is the case in those other countries. Such taxes would force up the cost of transportation and force companies to move in the direction of multiple facilities and less specialization with the resulting decrease in productivity and competitiveness.

Imposition of transportation energy taxes that are not invested in transportation would, in my judgment, be especially harmful to productivity growth in manufacturing. Data Resources Inc., for one, has suggested a 10 percent energy tax to fund, for instance, further investment, would reduce real GNP growth by about a half percent per year. The Joint Committee on Taxation recently issued a report stating policies which increase energy prices will harm U.S. competitiveness. So we have to be careful about the level of infrastructure investment that we come up with and how we fund it.

This dilemma between the need for transportation improvements and the negative consequences of a tax increase can, at least to fund that investment, can at least, in part, be resolved by more wisely selecting the projects we invest in and by assuring that the money we spend brings the maximum quantity and quality of facilities possible. And I would like to address each of these points.

Regardless of whether more or less money is spent on these projects, there is a clear need for better project selection criteria. Whether project selection occurs at the federal level, in the case of demonstration projects, perhaps, or at the most local level, decision-makers should be required to consider a criteria that addresses competitiveness and productivity benefits of competing projects.

For too long decision-makers have selected projects based on engineering sufficiency criteria that did not take into account productivity benefits, quality of payment and so on. A better approach would be to require a present value cost-benefit analyses and rankings of all projects. Project benefits typically relate to value of time savings, reduced vehicle operating costs and industrial restructuring opportunities that allow for smaller more frequent delivery with resulting inventory savings.

However, the benefit sides of such analyses are subject to considerable exaggeration, as we all know, and misrepresentation, and the cost benefits approach cannot be entirely relied upon.

Selection criteria must also consider cost effectiveness measures of projects, especially for comparisons between competing approaches to solving a particular problem. Examples of such criteria include measures of cost per mile, cost per rider or ton of freight moved, and cost per unit of environmental cleanup benefit. While simplistic and incapable of examining the benefits related to a project, such measures can help to weed out projects that clearly do not stack up.

Projects that are designed to enhance city images and line private developers' pockets instead of moving goods and people will often fail these tests. We simply cannot afford to punch money into ill-conceived projects that come from nowhere and go no place on the premise that riders will indeed come to these projects.

While there are areas where mass transit, light rail and subway projects probably make sense, we must come to the realization, I believe, that such projects are often ill-conceived boondoggles that we cannot afford to fund. In many cases simple bus systems are far more effective. For instance, consider the cost of the new Los Angeles subway system, just to pick on one. Perhaps it is worth the benefit in environmental returns, but it certainly is worth questioning at $329 million per mile and a projected ridership of 7800 per day. If you spread that over 30 years, you are looking at $16 per rider.

I can speak with some experience about projections of ridership that we have seen in the Detroit area from our people-mover project and tell you, if anything, 7800 a day may be optimistic, at least for the initial ridership.

One more approach to seeking better investment decisions has been to shift about 17 percent of the funding decisions closer to local MPOs. It is not entirely clear that the MPOs are up to this task, or their interests lie in projects that improve national competitiveness while providing little local taxpayer benefits. Those of us concerned about the competitive freight transportation system are especially concerned local MPOs will not take freight interests, for instance, into account.

Congress addressed this issue in part by mandating a National Highway System, however States can shift some of those funds. Congress will need to assure the National Highway System is adequately funded but also there will need to be considerable oversight to be sure projects that affect our export competitiveness, such as freight access to ports, are capable of being funded by local decision-makers and, in fact, get funded.

Congress should also consider better application of cost effectiveness and cost benefit analysis to all demonstration project candidates. Sponsors of all such projects should be required to submit data on selection criteria and committee staff should develop a ranking of projects on several of those criteria. While regional income distribution objectives may rightly result in less highly ranked projects being selected in some cases, projects should be required to meet at least a present value cost benefit breakeven point or a minimum cost per usage unit criteria.

The Congress would also do well to assure more demonstration projects do, in fact, have a demonstration benefit. Example projects that take a look at the value of thicker pavements, going to more European oriented pavement systems are a number of examples.

Second approach to dealing with the needs/funding dilemma is for the Congress to begin addressing institutional barriers to more efficient construction of transportation infrastructure. In short, the Congress should consider changes to a series of policies that have tilted the playing field in favor of interests that are intent on stopping all development, and all improvements in productivity and competitiveness as a result. Changes need to be made to environmental, land use, and federal regulatory policies in order to obtain a more reasonable quantity and quality of facilities for the dollar we invest.

In the environmental arena there are a variety of federal policies that result in an underachievement of both environment and transportation objectives. Take the Endangered Species Act. There is no provision for landbanking of habitat. As a result, each minor habitat must be protected, rather than improving one major habitat that might exist in a State.

In Michigan the latest example involves the Mitchell's Satyr butterfly. Habitat for the butterfly is causing an expected two year delay in the completion of a 12.5 mile $144 million section of U.S. 31. The act results in the State having to reroute the project, even though a more desirable environmental result, at less cost, would result from the State enhancing and enlarging one of the butterfly's other ten habitats in the State.

Other environmental examples abound. In the case of wetlands preservation, planned highway widenings and new routes are continually being redesigned to accommodate new definitions and interpretations of wetlands areas, and others. There is considerable question about how much of the transportation funding that is made available is actually going to buy wetlands. It is an interesting question and, in a broader sense, how much of the investment is going to meet environmental requirements, period? It is something I think we need to have some answers on and will require some consideration.

Mitigation rules favor creation of new wetlands and small parcels adjacent to each disrupted site rather than creating several large and more beneficial sites in various watersheds of a given State.

I would also mention anticipated changes to the Clean Water Act are resulting in highway reconstruction designs being contemplated that result in water treatment facilities for non-point source runoff and we are looking at that in Michigan on I–94 rebuilding in the Detroit area. Of course, those kinds of facilities would cost millions and divert funds from perhaps more important cleanup projects such as storm sewer overflows that result in the direct discharge of untreated sewage into rivers and streams.

NEPA and other permitting requirements are also causing major project delays by allowing local project opposition groups major opportunities to stall projects. These delays often drive up the cost of land acquisition by allowing speculators to move in and acquire lands while the regulatory and legal processes are played out. In Michigan, a widening of M–59, which happens to be in Congressman Carr's district, has been delayed for years and the cost of right-of-way has jumped to $103 million while construction costs are just $106 million. Multiple environmental permitting requirements and independent hearing processes are also causing unnecessary delays.

Finally, because regulatory agencies are not involved in early design and planning stages of highway projects, there is often a need to rework preliminary designs that come out of transportation departments.

I would also like to note in terms of the issue of short-term stimulus, that even minor projects take six months to a year to plan and, in fact, any additional funding for northern States is almost too late now for the 1993 construction season.

Yes, you will have people tell you that projects can be brought on line. They want the money. But what I am told at the operating levels, at least in the sources I have contacted, is that it is in northern States almost too late right now, let alone March or April or May, to bring even pavement resurfacing projects on board except for the most minor kinds of projects. And it won't be too far out before 1994 is at stake for northern States.

Let me just conclude by saying, in summary, transportation infrastructure investments can have a positive impact on productivity and competitiveness. However, the opportunity costs of any major new tax programs could offset the benefits, especially if taxes were not devoted to transportation, as has recently been suggested, in terms of an energy tax to apply towards deficit reduction.

A partial solution to that is to improve the choice of investment projects by requiring more cost benefit and cost effectiveness oriented selection criteria by both the Congress and local players. Let me say the investment dollar could also be stretched significantly if a number of institutional changes were made to speed projects along or promote more reasonable environmental solutions.

In my prepared statement I have listed eight or nine recommendations that you might want to consider, and I will just mention one of those, which might be looking at how this committee works with some of the committees that draft environmental legislation to see how we may be moved towards improving maybe the environmental result and the transportation result for a given number of dollars. Whether that is institutionally possible in the Congress today, I don't know, but there needs to be some movement, I believe in that direction.

Thank you.

Mr. CARR. Thank you, Dr. Taylor.

[The biography and prepared statement of Dr. Taylor follows:]

Dr. John C. Taylor
Assistant Professor
Department of Marketing
Wayne State University

Dr. Taylor is an Assistant Professor in the School of Business Administration at Wayne State University. His teaching and research focuses on international trade and transportation policy issues.

Dr. Taylor's recent research has been directed at an investigation of the manufacturing plant and warehouse location implications of a North American Free Trade Agreement. He has also conducted a number of policy studies on United States-Canada border transportation issues and most recently has issued a report on highway border crossing authority options and funding approaches. His recent work also includes a report on the economic feasibility of a new double stack railroad tunnel to serve the Michigan-Ontario gateway, and a Michigan Senate evaluation of the state's international trade and investment programs. Dr. Taylor has also conducted extensive research on the impact of intrastate trucking economic regulation.

Dr. Taylor's recent clients include the Michigan Senate, Michigan Department of Transportation, Michigan Department of Commerce, Association for Safe and Competitive Transportation, A.T. Kearney, Inc., and a number of other private organizations. He is a frequent witness on international trade and transportation policy issues before Michigan legislative committees and has spoken on these topics to a wide variety of organizations. Dr. Taylor is a faculty member for the Canadian Council of Logistics Management's annual logistics seminar, and has served as a faculty member on NAFTA and other international issues for a special series of logistics seminars for United Parcel Service.

Dr. Taylor is a member of the National Commission on Intermodal Transportation, a U.S. Congressional Commission created to make legislative recommendations on ways to eliminate barriers to intermodal transportation efficiency. He also is a member of the National Motor Carrier Advisory Committee, a U.S. Department of Transportation Panel which provides advice on NAFTA and other motor carrier issues.

Dr. Taylor obtained a Ph.D. from Michigan State University in 1991. Prior to entering the Ph.D. program, he spent seven years with Clark Equipment Company in international business operations, and three years with Dialog Systems, Inc., a logistics consulting firm. He has lived and worked for extended periods of time in both Sao Paulo, Brazil, Sydney, Australia, and is fluent in Portuguese.

Before the

SUBCOMMITTEE ON TRANSPORTATION
COMMITTEE ON APPROPRIATIONS
U.S. HOUSE OF REPRESENTATIVES

FEBRUARY 4, 1993

Statement of

John C. Taylor, Ph.D.
Department of Marketing
School of Business Administration
Wayne State University

On

TRANSPORTATION INVESTMENT STRATEGIES

Mr. Chairman and Members of the Committee,

My name is John C. Taylor. I am an Assistant Professor of International Marketing and Logistics at Wayne State University in Detroit, Michigan. My professional background is in transportation policy and the logistics operations of firms.

THE U.S. MANUFACTURING AND DISTRIBUTION SYSTEM

An efficient and cost effective transportation system is critical to the productivity and competitiveness of the U.S. economy today. Our economy, perhaps more so than any other in the world, is based on a high degree of production and services specialization. That high degree of specialization, and the long distances between producers in our integrated North American continent, result in very large demands for transportation services.

At the same time, manufacturers increasingly rely on centralized production and distribution systems which allow for the minimization of component and end product inventories. Such a system demands cost effective, and more importantly, reliable, transportation services in order to meet customer service requirements without reliance on efficiency robbing inventory.

The "just-in-time" system I have described places greater emphasis on several forms of transportation services. First, there is an increasing volume of low weight shipments, and an increasing demand for package and courier deliveries. Such shipments often move by air, and then by truck or delivery vehicle, or by expedited overnight truck service. Cost pressures have also forced shippers to rely more on rail movements, often in conjunction with trucking pickups and deliveries. These intermodal services rely on multiple modes for various portions of a movement so as to maximize customer service while minimizing cost.

TRANSPORTATION SYSTEM PROBLEMS AND NEEDS

A cost effective and reliable transportation system is critical to the success of U.S. industry, and to increasing the productivity and competitiveness of the U.S. economy. However, the transportation system is displaying several problems that require attention. First, the U.S. Department of Transportation has estimated that highway delays in urban areas now total over two billion hours annually, costing billions of dollars in lost working hours, and additional billions in cost for shippers and carriers. In addition, flight delays are costing business an estimated $5 billion a year. We also have severe highway and rail access problems at many of our ports and airports.

The above problems call for new facilities, highways and heavy and light rail investments in some cases. This is especially true in some of the suburban areas of our major cities where transportation demands are increasingly suburb to suburb. However the biggest investment needs may well be in the area of maintenance and rebuilding of portions of the current system. This is especially true on some of our older and more heavily traveled highways - often in metropolitan areas.

TRANSPORTATION INFRASTRUCTURE AND PRODUCTIVITY

These problems and unmet transportation needs raise questions about the possible negative impact on overall U.S. productivity and competitiveness. They also raise questions about the extent and type of increased spending that may be required, and about the source of funding for such expenditures. Several economists, including some testifying today, have suggested that up to half of the decline in productivity growth in the 70's and 80's was due to a lack of core infrastructure investment. Some studies have also indicated that public investment has a higher productivity return than private investment, although most economists would question these claims. For instance, a recent FHWA review of the issue concludes by quoting McGuire's 1992 work stating that "public capital has a weak, positive effect on private economic activity."

It is interesting to note that productivity growth has been increasing the last couple of years, calling into question some of the previous work's conclusions. Clearly, more work is needed in this area and several projects are underway or planned. For instance, the Corp of Engineers is coordinating a multi-agency study on the issue of infrastructure investment and its impact on the economy, and USDOT's Bureau of Transportation Statistics is hoping to proceed with some major research in this area. While there is no doubt that infrastructure investment has a positive return the question is really one of what the opportunity costs are for that investment.

ENERGY TAX IMPACTS ON PRODUCTIVITY AND COMPETITIVENESS

Any substantial increase in energy or user taxes represents such an opportunity cost and will have an adverse impact on the competitiveness of U.S. industry, although the impact would be reduced if the proceeds were wisely invested in transportation projects. While it is true that other countries have far higher energy taxes than the U.S., the long distances across the U.S. continent, and our high degree of specialization, mean that an energy tax would have a far greater negative impact than is the case in those other countries. Such taxes would force up the costs of transportation and force companies to move in the direction of multiple facilities and less specialization, with a resulting decrease in productivity and competitiveness.

Imposition of transportation energy taxes that are not invested in transportation would, in my professional judgement, be especially harmful to productivity growth in manufacturing. Data Resources, Inc., to quote one expert source, has found that a 10% energy tax would reduce real GNP growth by about half a percent per year. And, the Joint Committee on Taxation recently issued a report stating that policies which increase energy prices will harm U.S. competitiveness.

THE TRANSPORTATION NEEDS/TAX DISECONOMIES DILEMMA

This dilemma between the need for transportation improvements and the negative consequences of a tax increase can at least in part be resolved by more wisely selecting the projects we invest in, and by assuring that the money we spend brings the maximum quantity and quality of facilities possible. I would like to address each of these points.

NEED FOR IMPROVED PROJECT SELECTION CRITERIA

Regardless of whether more or less money is spent on transportation projects, there is a clear need for better project selection criteria. Whether project selection occurs at the federal level, or at the most local level, decisonmakers should be required to consider criteria that address competitiveness and productivity benefits of competing projects.

For too long, decisionmakers have selected projects based on engineering sufficiency criteria that do not take into account productivity benefits. A better approach would be to require present value cost-benefit analyses and rankings of all projects. Project benefits typically relate to value of time savings, reduced vehicle operating costs, and industrial restructuring opportunities that allow for smaller more frequent deliveries with resulting inventory savings. However, the benefit sides of such analyses are subject to considerable exaggeration and misrepresentation and the cost-benefit approach can not be entirely relied upon.

Selection criteria must also consider cost effectiveness measures of projects, especially for comparisons between competing approaches to solving a problem. Examples of such criteria include measures of cost per mile and cost per rider or ton of freight moved. While simplistic and incapable of examining the benefits related to a project, such measures can help to weed out projects that clearly do not stack up. Projects that are designed to enhance city images and line private developers pockets, instead of moving goods and people, will often fail this test. We simply cannot afford to pump money into ill conceived projects that come from nowhere and go no place on the premise that riders will come.

While there are areas where mass transit light rail and subway projects may make sense, we must come to the realization that such projects are often ill conceived boondoggles that we cannot afford to fund. In many cases simple bus or ground level trolley systems would be far more effective. Consider the costs of the new Los Angeles subway system, perhaps worth the cost in environmental benefits, but worth questioning at $329 million per mile and a projected ridership of 7,800 per day. Over 30 years that amounts to $16.97 per rider.

One approach to seeking better investment decisions has been to shift decisions closer to local MPO's. However, it is not entirely clear that the MPO's are up to this task, or that their interests lie in projects that improve national competitiveness while providing little local taxpayer benefits. Those of us concerned about a competitive freight transportation system are especially concerned that local MPO's will not take freight interests into account. The Congress addressed this issue in part by mandating a National Highway System, however, states can shift up to half of this funding to mass transit projects with federal approval. The Congress will need to assure that the National Highway System is adequately funded. There will also need to be considerable oversight to assure that projects that directly affect our export competitiveness, such as freight access roads to ports, are capable of being funded by local decisonmakers.

The Congress should also consider better application of cost-effectiveness and cost-benefit analysis to all demonstration project candidates. Sponsors of all such projects should be required to submit data on selection criteria and staff should develop a ranking of projects on several criteria. While regional income distribution objectives may rightly result in less highly ranked projects being selected in some cases, projects should be required to meet at least a present valued cost-benefit breakeven point, or a minimum cost per usage unit criteria. The Congress would also do well to assure that more "demonstration" projects do in fact have a demonstration benefit.

NEEDED INSTITUTIONAL CHANGES

The second approach to dealing with the needs/funding dilemma is for the Congress to begin addressing institutional barriers to more efficient construction of transportation infrastructure. In short, the Congress should consider changes to a series of policies that have tilted the playing field in favor of interests that are intent on stopping all development, and all improvements in productivity and competitiveness as a result. Changes need to be made in environmental, land use, and federal regulatory policies, in order to obtain a more reasonable quantity and quality of facilities for the dollar.

In the environmental arena there are a variety of federal policies that result in an underachievement of both environmental and transportation objectives. Take the Endangered Species Act. There is no provision for landbanking of habitat. As a result each minor habitat must be protected, rather than improving one major habitat. In Michigan, the latest example involves the Mitchell's Satyr butterfly. Habitat for the butterfly is causing an expected two year delay in completion of a 12.5 mile $144 million dollar section of U.S. 31. The Act results in the state having to reroute the project, even though a more desirable environmental result, at less cost, would result from the state enhancing and enlarging one of the butterfly's other 10 habitats in the state.

Other environmental examples abound. In the case of wetlands preservation, planned highway widenings and new routes are continually being redesigned to accommodate new definitions and interpretations of wetlands areas. And mitigation rules favor creation of net new wetlands in small parcels adjacent to each disrupted site, rather than creating several large and more beneficial sites in various areas of the state.

Anticipated changes to the Clean Water Act are also resulting in highway reconstruction designs that contemplate water treatment facilities for non-point source runoff. Such facilities would cost millions and divert funds from more important cleanup projects such as storm sewer overflows that result in the direct discharge of untreated sewage into rivers and streams.

NEPA and other permitting requirements are also causing major project delays by allowing local project opposition groups major opportunities to stall projects. These delays often drive up the costs of land acquisition by allowing speculators to move in and acquire land while the regulatory and legal processes are played out. In Michigan a widening of M-59 has been delayed for years and the cost of right-of-way has jumped to $103.4 million while construction costs are just $106.4 million. Multiple environmental permitting requirements and independent hearing processes are also causing unnecessary delays. Finally, because regulatory agencies are not involved in early design and planning stages of highway projects there is often a need to rework preliminary designs.

Federal Highway Administration rules and regulations, while improved, still contribute to long delays in projects and increased costs. A major highway project now, as a result of the full maze of FHWA and EPA regulations, takes in the range of 5-7 years to plan. Even the most minor projects take six months to a year to plan. In fact, any additional funding for Northern states is almost too late now for the 93 construction season. Federal rules on local match by not-for-profit agencies and private entities also need streamlining and clarification. For instance, Michigan was recently told that a local government could not contribute local match for transportation enhancement funding.

CONCLUSSIONS

In summary, transportation infrastructure investments can have a positive impact on the nations productivity and competitiveness. However, the opportunity costs of any major new tax programs could offset the benefits, especially if the taxes were not devoted to transportation. A partial solution to this dilemma is to improve the choice of investment projects by requiring more cost-benefit and cost-effectiveness oriented selection criteria by both the Congress and local players. The investment dollar could also be stretched significantly if a number of institutional changes were made to speed projects along and promote more reasonable environmental solutions that would enhance both the environment and the transportation system.

Mr. CARR. Next, we are pleased to hear from Dr. Peter Ruane. Incidentally, all of the prepared statements will be entered into the record, and, in the interest of time, perhaps you could summarize. I have already read your statement and a lot of it deals with the needs, and as I said before you arrived, we will stipulate to the needs. What we are having a harder time with is how do we take available resources and do something, as Dr. Aschauer says, do something wise with it. How do we wisely spend the money we already have? Maybe you could give us some pointers. You may proceed.

STATEMENT OF DR. PETER RUANE

Dr. RUANE. Very good. Thank you, Mr. Chairman, Mr. Wolf, members of the Committee. First I want to apologize for my voice, I sound like a cat crawled in my throat and died. Probably ate at Jack in the Box last night, I don't know, but I have a bad raspy voice. I apologize up-front.

I want to commend you for holding this hearing. The timing couldn't be better. We are entering into a watershed period for transportation development in this country as we all know. And I should point out that we, ARTBA, the American Road and Transportation Builders Association, and perhaps one of the reasons we were asked to testify today, is we do represent the total spectrum of transportation construction, not just the contractors but also the engineers, the suppliers, manufacturers, public officials and the education community.

Our basic tenet has and will be always that America will never have the transportation system it needs without the adequate financial resources to construct, maintain and operate our systems.

To address the first point, and the purpose of this hearing, the supplemental appropriation that has been suggested by a number of folks, and a stimulus package that is being considered by the new administration, I think it is instructive to point out that the survey that many of you have talked about so far this morning and early this afternoon, the AASHTO survey, it is important to note that while those projects are, in fact, the ones probably in the pipeline, most likely all of them are in the pipeline, they would never be able to be provided nor could the money be applied properly if they were not in the pipeline.

In fact, that is not a liability but an asset, given the time constraints that several people have mentioned, the delays inherent in getting these projects on stream with environmental issues and safety issues. The fact that the initial engineering and clearance work has already been accomplished is an asset and the criteria that they use in their survey of getting these under way within 30 to 90 days of enactment, again, 30 to 90 days is really an asset.

We have done a similar survey in recent months with our public officials division. We have some 800 local transportation officials throughout the country who manage the county road programs and airport programs and they have underscored as well a sizable need that is out there that is readily available for undertaking and completing. And it is also important to point out that the capacity of the industry to respond to an immediate economic stimulus package is there.

The industry is not experiencing the economic recovery that others have referred to, that the unemployment rate in the construction industry is at 14 percent, twice the national average, and the level of competition in the industry is quite severe, and there is ample capacity in all sectors to respond to any measure of added stimulus that is provided by the Congress and the new administration.

One of the things that I would reference in my remarks today and which we are releasing today at this hearing is a recent public opinion poll, which I think is quite germane to your discussion of a short-term package as well as long-term investment needs of the country.

A poll was done for our organization by Penn & Schoen, a national public opinion polling firm, in which they took a randomly sampled 1,000 Americans in all 50 States and it is instructive to note that some 83 percent of the respondents do in fact favor such an immediate economic stimulus package, if in fact the initiative is oriented toward public works.

In fact, some 71 percent of those same respondents support an increase in the gas tax if it is exclusively dedicated to finance highway and bridge improvements and, again, some 75 percent of those same respondents oppose using the gas tax as a way to raise general revenue, which just so happens to coincide I think with the unanimous opinion of the entire transportation development community, and other witnesses here today that the use of the gas tax for non-transportation purposes would make much of our discussion today and in the future quite moot, if in fact we eliminate the ability to fund the kind of programs we are talking about today.

ISTEA has been mentioned by a number of witnesses and members of the Committee. It does of course have an intermodal focus and we commend the Congress and the administration for emphasizing that in recent years. We would like to point out, though, our concern that in the attempt to look at these decisions from an intermodal expansion point that we not lose sight of where the basic needs are in the country.

And as the chairman has noted, in our statements we make reference to the recent DOT needs study that was released two weeks ago, which once again underscores the gap that exists between the amount of funding that is being provided today and what the actual needs are. So it is some $15.5 billion gap between just taking care of our current conditions, not new construction but taking care of what already exists. So the ISTEA legislation and its funding authorization did not solve the needs question.

In terms of the role of new technology, we underscore the fact that the IVHS movement is promising and we encourage this Committee and the Congress as a whole to continue to support research and development for that mode as well as new toll road technology developments that are emerging.

Perhaps one of my central points today I would like to share with the Committee is, in fact, our concern about the structure and role of the National Highway System in future considerations by this Committee and the Congress. This, in our minds, is the most strategic federal investment program that is in our transportation assets right now, and we would encourage the Committee to take a hard look at the deliberations that are under way regarding the establishment of the new National Highway System, the Congress, of course, will be approving this system by September of 1995.

The States right now, this year, are delineating and redefining the categories of highways and will, by the end of the year, be providing their recommendations to the Secretary of Transportation as to what should be contained in the National Highway System.

This, in our judgment, is the most crucial transportation decision that you all will make in the next two years as to what is actually contained in that system, and we would urge this subcommittee to make funding for the National Highway System a top priority.

In our statement, and I recall the discussion earlier here this morning, we make reference specifically to some strategic initiatives regarding the border infrastructure programs, the NAFTA emerging legislation, and specifically some local economic growth needs that are well identified throughout the country.

And, again, I would urge that this be looked at closely because when you look at this new needs report, you will see quickly that the National Highway System as defined under the recent legislation, there is a tremendous gap, in our judgment, on the order of about $15 billion a year short in what should be invested in the National Highway System.

We recommend specifically a dedicated revenue source be considered for the National Highway System as a key long-range investment strategy for this Committee and the Congress as a whole.

We also comment on another issue which the last witness mentioned, the quality of construction. Quite a bit of coverage in recent months and this last year in particular regarding comparisons between the American Transportation System, the U.S. Transportation System, and European roads, and I would point out to this Committee that the real issue revolves around the philosophy inherent in many European countries in terms of the level of resources that they dedicate to their transportation system; the actual specifications that they lay out for the construction of their roads and transportation systems.

And when one looks at these closely, you clearly see that we are no where investing the level of resources, it is double our level of resources in the United States, and, of course, the actual design and specification of the roads are much greater, thicker pavements, much larger foundations, et cetera. And I think that is an issue that this Committee should take a look at.

This, of course, raises the elementary question of how do you pay for better systems to meet these basic needs that have been identified. I also refer, once again, to a study that I think this Committee is familiar with, last year the General Accounting Office underscored crucial issues; that we will be facing a shortfall of revenue in the Highway Trust Fund by fiscal year 1995 due to the lack of money coming in because of the recession, with less use of motor vehicles, and the fact that we really, the authorizations will not be fulfilled unless something is done. And this same report identified a rather simple solution at least for the short-term, which is to transfer the two-and-a-half cents from the 1990 budget agreement back into the Highway Trust Fund to enable this Committee to appropriate funds for full authorization of ISTEA.

The other strategic issue of course is the long-term financing of our nation's transportation systems. I think, again, when you look closely, you look at the issue raised by this GAO report, you look at the loss of revenue as a result of the subsidy of certain motor fuels, gasahol in particular; you look at the implications of both current and emerging energy policies, particularly in the alternative fuel area, you will see that the outlook for long-term funding for transportation is questioned. We believe that any energy source that powers passenger vehicles should be taxed the same as gasoline to ensure that there is, in fact, adequate funding for the future.

And finally, we would recommend, in light of this reality, that is the erosion of our basic financial base for transportation, that this Committee respectfully suggest that this Committee conduct a comprehensive study to produce recommendations for putting the Highway Trust Fund on a financial basis for decades to come, and, at the same time, to keep in mind the specific needs of the States who really, they are limited in their ability to raise revenues based on what the Federal Government does, particularly with the gas tax and you would keep that in mind in undertaking such a study.

Again, thank you. I am gratified to be here and would be happy to answer any questions.

Mr. CARR. Thank you, Dr. Ruane.

[The biography and prepared statement of Dr. Ruane follow:]

DR. T. PETER RUANE

PRESIDENT AND CEO
AMERICAN ROAD & TRANSPORTATION BUILDERS ASSOCIATION
WASHINGTON, D.C.

Dr. T. Peter Ruane is the president and chief executive officer of the American Road and Transportation Builders Association (ARTBA), a ninety year old national federation of public and private transportation construction interests with some 4,000 members based in Washington, D.C. He has over 20 years of diversified experience in the economic development, transportation and construction fields.

Prior to joining ARTBA in October 1988, he served for nine years as President/CEO of the National Moving and Storage Association (NMSA) and its affiliate organizations.

Dr. Ruane has also served as the deputy director of the Office of Economic Adjustment (OEA), Office of the Secretary of Defense and the President's Economic Adjustment Committee.

He has worked on complex economic development projects stemming from base closures or growth impacts in more than 30 states over the period 1970 to 1980.

While in federal service, Dr. Ruane was a recipient of the top two management awards available to a young federal executive.

Dr. Ruane is a graduate of Loyola College of Baltimore, Maryland, and holds a master's degree from the Pennsylvania State University and a doctorate from the George Washington University in Washington, D.C.

He is a decorated Vietnam veteran, having served with distinction as an officer with the U.S. Marine Corps.

Dr. Ruane has also served as chairman of the Small Business Legislative Council (SBLC), a permanent coalition of over 100 trade organizations representing the entire spectrum of U.S. business. He has held numerous volunteer and elective positions including president of his parish school board (St. Mary's of Annapolis). He currently serves as a director of SBLC and the International Road Federation.

ARTBA
AMERICAN ROAD & TRANSPORTATION BUILDERS ASSOCIATION

Testimony Of

AMERICAN ROAD & TRANSPORTATION BUILDERS ASSOCIATION

Presented By

T. Peter Ruane
President & CEO

Before

Subcommittee on Transportation Appropriations
U.S. House of Representatives
Washington, D.C.

February 4, 1993

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Good morning, Mr. Chairman, Mr. Wolf, members of the subcommittee.

I am T. Peter Ruane, president and CEO of the American Road and Transportation Builders Association (ARTBA). It is a pleasure to join you today for this very important discussion of the long-range outlook for our nation's transportation system.

It is ARTBA's fundamental belief that an efficient, coordinated, well constructed and well managed transportation network is essential to both the economic and social well-being of the United States.

Today, our country lies at a crossroads in many respects, including the future development of our means of mobility. The decisions we make now will influence the course of events well into the 21st century. For that reason, these hearings are vital to charting the correct course for the investment of scarce financial resources to assure that America will not be hampered by inadequate means of mobility as it seeks to compete in an increasingly competitive and diverse world.

For those reasons, I commend you for calling these hearings early in the 103rd Congress to develop a rationale for the decisions you must make.

Mr. Chairman, A-R-T-B-A has just completed its 90th year as the only national association representing the full range of transportation development interests. Our membership of 4,000 firms and individuals includes contractors, engineers, public officials, educators, suppliers of materials, equipment manufacturers and financial institutions. They are involved in the planning, financing, construction and operation of highways, bridges, airports, transit systems and railroads.

Thus, we bring to this discussion a comprehensive viewpoint which I believe will make a positive contribution to your inquiries.

The basic tenet of our organization is the conviction that America will never have the transportation system it needs unless we are willing to commit ourselves to providing financial resources adequate to its construction, maintenance and operation.

With that understanding, I would like today to review some of the issues that need to be addressed in this watershed period of our development. The decisions that are made in the immediate future will go a long way toward determining the shape and focus of our transportation program.

Before looking at the issues affecting the long-range operation of surface transportation programs, it is important to acknowledge proposals that will be before Congress in the next few weeks.

Before the end of this month, the new administration is expected to call for enactment of supplemental activities to stimulate recovery from the recession. ARTBA strongly supports the approval of additional investments in transportation infrastructure as a part of the president's economic package.

Not only are improved facilities needed as investments in the future, such a program would increase job opportunities in the construction industry, which continues to suffer from an unemployment rate double the national average.

Mr. Chairman, President Clinton strikes a chord with the American public when he speaks of expanding investment in our nation's highway and bridge system. Americans strongly support investments in highway and bridge improvements -- and they are willing to pay for them.

This past Saturday, January 30, the national polling firm of Penn & Schoen surveyed 1,000 American adults for ARTBA on this issue. Eighty-six percent -- nearly nine-in-10 Americans -- say they favor a public works initiative to improve the nation's roads and bridges as a way to create jobs and stimulate the economy.

Seventy-one percent said they would even support an increase in the federal gasoline tax today if they were assured that the resulting revenue would be used exclusively to finance highway and bridge improvements.

What three-in-every-four Americans do not support, Mr. Chairman, is increasing the federal gasoline tax as a way to raise general revenue for the federal government. That viewpoint is consistent with the long-standing policy of ARTBA which unalterably opposes the use of federal motor fuel taxes for deficit reduction or any other non-transportation purpose.

We hope you will help us bring these messages to the White House and the congressional leadership. Transportation should be a key element of the Clinton economic program.

Mr. Chairman, we are indeed presented with an opportunity not afforded since 1956 when construction of the Interstate highway system was started. For 36 years, the primary focus of the nation's road building activity has been on completing the 45,000 miles of that system. We have invested more than $130 billion in the Interstate system, and it is now nearly completed. It is an achievement of which to be proud.

The Interstate system has vastly increased the nation's mobility and contributed to our economic strength. But there has been a price. Concentration on the Interstates drew resources from other roads and bridges so that today many parts of our country face a transportation deficiency.

Furthermore, the age and condition of many segments of the Interstate system require substantial repair, reconstruction and expansion, ironically, even before the basic system is quite finished. And changing demographics have created demands for transportation facilities where none existed before.

Overlaying all of this are new concerns about environmental protection, economic growth, energy conservation and social issues.

Therefore, it is obvious that transportation, like so many other aspects of contemporary society, cannot exist in a vacuum. From now henceforth, transportation policy decisions will have to be made in a broader context.

A step in that direction was taken in 1991 with enactment of the *Intermodal Surface Transportation Act,* commonly--and regrettably--known as "ice tea." That legislation certainly is not perfect. In fact, ARTBA feels that in some areas the correct decisions were not made. The new act does acknowledge, however, that transportation, the environment, urban planning and other factors are interdependent and must be pursued together. For better or worse, ISTEA is the guide for the nearly five years of its authorization period remaining.

Inclusion of the term "intermodal" in the act's title accurately describes the approach that should be taken to transportation in today's complex society. I would caution, however, that we retain a proper perspective with respect to the roles assigned to the individual modes of transportation, roles that are not necessarily interchangeable.

In the quest for intermodality, Mr. Chairman, let's not let highways and bridges be lost in a generic shuffle. They are the basic pathways of transportation in the United States that have facilitated our development as a nation. Roads and bridges have contributed enormously to American democracy by allowing our citizens to exercise the unprecedented personal mobility that has virtually become a basic civil right.

Today, I would like to discuss several issues that ARTBA believes should receive the subcommittee's attention as it develops a rationale for allocating funding and thereby shaping transportation policy.

The first of these are the quantified needs of our surface transportation infrastructure. The second is the role of emerging new technology to improve the productivity of our transportation resources. Third is the structure and role of the National Highway System, perhaps the most crucial transportation decision to be made by Congress in the next two years. Fourth is the absolute necessity to improve the durability of our transportation infrastructure to enhance the return on the substantial investments made by the taxpayers.

Finally, none of the things we hope for in the future will come to pass if we do not give serious attention to the way federal transportation programs are paid for.

The U.S. Department of Transportation is required every other January to submit to the Congress a report on the conditions, performance and capital investment requirements of the nation's highway and bridge network. It is commonly refereed to as the "needs" report.

Traditionally--and not unlike many other government reports--this document is not made available in a timely fashion. The 1991 report, for example, was not available to the Congress until July of that year. By that time, development of ISTEA was well under way without the benefit of the report's findings.

The July transmittal, incidentally, came only after ARTBA filed a request under the Freedom of Information Act seeking the report's release.

We are gratified, therefore, that the 1993 DOT report was prepared and made available on time last month.

The "needs" report's findings are always instructive. For instance, it states that maintaining conditions on the nation's roads and bridges as they existed in 1991, would require an average annual investment of $51.6 billion for the next 20 years.

Actual improvements to the highway and bridge network would cost $67.3 billion a year over the next two decades. In 1991, however, only $36.1 billion were actually spent for capital improvements to this system.

So, capital spending is short by $15.5 billion a year of just keeping these roads and bridges in the condition they were in two years ago! Most motorists will agree that those conditions were, and are not, wholly satisfactory.

The 1993 "needs" report shows some modest improvement in road conditions over the previous two years. But the fact remains that 234,500 miles of arterial and collector roads, the ones carrying the heaviest traffic, have pavement rated as "poor" or "mediocre."

And, although the number is down slightly, there are still 118,500 bridges rated as "structurally deficient."

The report contains many facts about the state of America's transportation. Here are just a few more:

- Highway congestion in the 50 largest urban areas costs the nation $39 billion a year;

- The increase in motor vehicle usage is expected to decline over the next 20 years from an annual growth averaging 3.5 percent in recent years to one percent in 2011.

- Air pollution emissions related to transportation have declined over the past decade largely because of greater use of non-leaded gasoline, reformulated fuels and the replacement of older cars with newer, less polluting ones.

One of the more interesting observations in the report is the gloomy prediction that under either the maintaining-conditions or improvement scenarios, things are not likely to get better in the nation's largest urban areas.

The report says: "Even under the assumptions of a significantly diminished rate of growth in travel demand,...extremely aggressive systems management, including transit expansion and Intelligent Vehicle Highway System (IVHS) application and expansion of capital investment in both highways and transit, current and anticipated demand will tax the transportation system's capacity to provide levels of mobility the public has come to expect."

Mr. Chairman, that single sentence suggests the magnitude of the challenge we face in attempting to extricate ourselves from the debilitating effects of a transportation system burdened by more than a decade of disinvestment.

While the need for basic highway and bridge construction and reconstruction will remain in the foreseeable future, there are some exciting new technological developments that will help assure greater efficiency in the use of our transportation infrastructure.

The promising world of Intelligent Vehicle Highway Systems--or IVHS-- is only beginning. As you, Mr. Chairman, stated in your January 26 speech, the full impact of IVHS may not be realized for eight or 10 years. For that reason, it is essential that a steady flow of financial support for research and development be continued.

In anticipation of a major role for IVHS in alleviating congestion, the basic hardware for IVHS should be a part of the needed reconstruction of Interstate highways in urban areas where it will be applied. There is no point in rebuilding a road now, only to dig up part of it in a few years to install sensors, cables and the other components of IVHS. IVHS development should be carefully coordinated with upgrading of the National Highway System.

Even closer to useful application are new methods of collecting tolls that could drastically reduce the number of toll gates on major arteries and the costs associated with them while, at the same time, speeding the movement of traffic. This technology is already being placed in service in local areas and there are plans well under way for establishing toll collection systems that might cover several states. Indeed, the day may not be far off when a motorist could drive from Washington to Boston over existing toll roads, stopping only once to make a payment.

Similar technologies could be used to operate the congestion pricing programs that are advocated to control traffic in busy urban areas.

Mr. Chairman, the "Intermodal Surface Transportation Efficiency Act" (ISTEA), signed into law on December 18, 1991, set in motion the framework for developing a strategic federal investment program designed to upgrade those existing highways and bridges that serve a national interest. The law directs the U.S. Secretary of Transportation to designate, in consultation with the states, a 155,000-mile "National Highway System" (NHS) which will serve as the focal point for future federal highway and bridge capital investments. Congress must approve the NHS map by September 30, 1995.

The NHS will help focus future federal highway funding on international and Interstate routes, as well as on roads that serve major population centers, ports, airports, and international border crossings. While the NHS will include only 4 percent of the nation's existing highway mileage, it is the mileage that carries 40 percent of total vehicle-miles traveled in this country -- including 80 percent of all tourist travel and 75 percent of all heavy truck travel.

Specifically, the NHS will include the 43,000-mile Interstate Highway System, existing major urban and rural arterials, the defense strategic highway network, and strategic intermodal highway connectors. The NHS will reflect the major demographic and travel changes that have occurred in this country since the designation of the Interstate Highway System nearly 40 years ago.

We urge the subcommittee to make funding for the NHS a top priority.

During the 102nd Congress, proposals were made to begin upgrading the bridges that link the United States and Mexico. It is obvious that the most ambitious plan to break down trade and economic barriers between the United States, Mexico and Canada cannot be fulfilled if there are bottlenecks at the borders and inadequate highways leading to them.

Even before the proposed North American Free Trade Agreement (NAFTA) goes into effect, the infrastructure needs of the area already are substantial. In one city alone, El Paso, Texas, truck traffic to and from Mexico has tripled since 1985 to more than 500,000 trucks a year. More than 1,500 trucks a day cross a single bridge in El Paso. There are similar stories all along the border.

Throughout the United States, too, exists the need for better roads to facilitate local economic growth. For the past 25 years, special attention has been given to the link between transportation and prosperity. A key objective of the NHS must be to provide the highways needed to help communities expand and strengthen their economies.

Unfortunately, the NHS proposal did not receive the detailed attention it deserved during congressional consideration of ISTEA. That situation should not be repeated when Congress is asked to approved the designated routes.

I recognize that it is part of the duty of a member of Congress to represent the interests of his or her state and that that duty can include obtaining the route mileage deemed necessary to each state. Our concern is that debate not be dominated by undue emphasis on new formulas to the deterrent of attention to broad strategic issues.

A crucial question concerning the NHS is one of financing. Many roads in the new system will require extensive reconstruction to bring them up to the standards necessary to meet the traffic demands that will be imposed on them. In addition, safety improvements should also be included. Beyond a safe roadway design must also be the signing and deliniation that is an ingegral part of safety. The aging of the driving population is just one of many factors that argues for greater safety-related investments.

The combined authorizations for the Interstate and NHS programs provided over the six years covered by ISTEA total about $43 billion. On the basis of the first two years of ISTEA, however, there is no assurance that the act will be fully funded.

Even if it were, that amount is inadequate to meet the needs of the NHS.

The answer is to substantially increase the authorization and adopt a funding mechanism that provides money exclusively for the National Highway System. The federal motor fuels tax should be increased and all, or a significant portion, of the revenues dedicated solely to the NHS, without the opportunity to transfer it to other uses as provided for most other activities under ISTEA.

The need for a dedicated funding source to build the Interstate system led to creation of the Highway Trust Fund. A similarly dedicated and segregated source of revenue is essential to make the NHS the focus of a long-range investment strategy in national transportation.

This discussion of the National Highway System leads us to my next subject, the quality of construction.

The quality of American highways when compared with those of other nations has been extensively discussed in the past couple of years. Much of this interest grew out of two European tours by American transportation officials and private sector interests, including ARTBA representatives. They visited the continent and brought back stories of roadways that lasted for 30 to 40 years.

American pavements, by contrast, have a life span of only about 20 years. The Interstate system, in fact, is designed for a 20-year life. That explains why much of the system is now listed by the Department of Transportation as in poor condition. The 1993 "needs" report, which I mentioned earlier, still bases its cost estimates on a 20-year cycle for replacement pavement.

That some portions of the system are still serviceable after more than 20 years is a credit to the ability of Americans to build durability into roads with a shorter life expectancy. The ability of our construction industry to produce quality is not in question: they have done it for many years.

The issue is one of specifications for road construction and the types of materials that are used.

There is no secret to building long-lasting roads. Much of the technology and the materials that are being utilized in Europe were developed in the United States. The story is similar to that of the videocassette recorder: invented in America, marketed by Japan.

A TIME magazine article last summer simplified the process of building long-lasting roads.

The base of a typical 40-year European is five-to-six feet deep while its American counterpart is two-to-three feet deep. The upper layers are comparably heavier, and the European road has a tough, weather-resistant surface incorporating the latest materials.

The difference between European and American road building is largely one of philosophy and of the willingness to commit financial resources to durability. Deeper, longer-lasting European roads simply are more expensive.

Highway construction costs in Europe are about double those in the United States, and they spend about 50 percent more for materials than we do.

For the past 37 years, we in the United States have been preoccupied with building the Interstate system. The emphasis was on getting the roads completed and into use as quickly as possible. That, in many ways, was a political decision to expedite construction of the Interstate system.

Mr. Chairman, initial construction of the Interstate system now is virtually complete. It is time for us to make another political decision and commit ourselves to a higher quality of highway construction. The place to start is with the rebuilding of the Interstate system and development of the National Highway System.

The time is ripe for the United States to determine that from now on, we will build roads that may cost more initially, but, with proper maintenance, will last longer and, over time, repay their higher cost many times over.

The next question logically is how to pay for better roads. Or even how to pay for meeting the current needs identified in the Department of Transportation's' recent report.

Financing of surface transportation programs requires immediate action even if existing program policy continues.

The immediate problem is the decline in revenue growth to the Highway Trust Fund. The General Accounting Office (GAO) reported last September that the trust fund would fall about $6 billion short of its ability to pay for the last three year's of ISTEA programs starting in fiscal year 1995.

The Congress and the Clinton administration are giving serious consideration to expanding federal infrastructure programs. Full funding of ISTEA is clearly the first step to be taken toward that objective. But, in order to do so, the trust fund problem must be addressed and solved.

Fortunately, there is a short-term solution.

In 1990, the deficit reduction agreement between Congress and former President Bush increased the federal gas tax by five cents-per-gallon. Half of that revenue was unwisely allocated to the general fund. The GAO study showed that the transfer of the 2.5 cents-per-gallon from the general fund to the Highway Trust Fund would compensate for the expected shortfall and allow full funding of ISTEA. There would be, in fact, a modest balance at the end of fiscal year 1997.

That revenue shift should be approved without delay so that the promise of ISTEA can be fulfilled.

But that would only take care of the immediate problem. The outlook for transportation funding in the years ahead is further clouded by other current and anticipated events.

The federal motor fuel tax, for 37 years a reliable and predictable source of revenue, can no longer be counted on to continue producing the levels of revenues needed to meet transportation needs. The current decline in revenue growth is but a symptom of deeper long-term problems.

The recent recession, of course, resulted in less driving and consequently less fuel consumption. But economic recovery will not necessarily mean an increase in trust fund income as it has in the past.

A new generation of automobiles with better fuel economy is requiring less gas. And the decline in travel growth--the VMT curve is flattening out--further dampens the revenue picture.

ARTBA is increasingly concerned that federal policy initiatives in the energy and environmental area are often advanced with little or no recognition of the impact they have on the federal government's long-term ability to finance highway and bridge improvements.

For example, since 1974, purchasers of gasohol -- a motor fuel blend of gasoline and alcohol -- have not been required to pay the full excise levied on gasoline sales. Today, the subsidy is six cents-per-gallon.

The Federal Highway Administration began tracking total gasohol sales by state in the early 1980's. In 1981, 713.3 million gallons of gasohol were sold. That represented less than one percent of the total motor fuel sold for passenger vehicles. By 1991, gasohol sales totaled 8.6 billion gallons, which represents almost seven percent of the passenger vehicle motor fuel market --a dramatic growth in 10 years!

In five states -- Nebraska, South Dakota, Iowa, Illinois, Indiana, Ohio and Minnesota -- gasohol holds more than a 20 percent market share. In Nebraska, it is 49.4 percent. In your own state of Michigan, Mr. Chairman, gasohol holds a 16 percent market share.

The federal subsidy on gasohol has cost the Highway Trust Fund $4.5 billion since 1974. To put that in perspective, it costs about $100,000 per-lane mile to resurface a section of Interstate Highway. We could have resurfaced the entire Interstate Highway System with the revenue that has been lost to the trust fund through the gasohol exemption.

New Clean Air Act mandates will increase the use of alternate motor fuels in this country. We believe it is imperative that any energy source that powers passenger vehicles that use publicly-financed highways be taxed at least at the same rate as gasoline to ensure that an adequate revenue stream is available for transportation improvements.

Similar erosion of trust fund revenue has occurred over the past decade as the American motor vehicle fleet has become more fuel efficient in compliance with federal mandates. Federal Highway Administration data show that in 1981 American motorists paid federal tax on just over 99 billion gallons of gasoline. In 1991, they paid the tax on 107 billion gallons of gasoline. In other words, total gasoline consumed only rose about nine percent over those 10 years. At the same time, however, vehicle-miles-traveled increased approximately 40 percent.

Proposals like that to increase CAFE standards to 40 miles-per-gallon would have a devastating effect on Highway Trust Fund revenue collections over time, unless these standards are tied to a corresponding change in tax policy on highway users.

These comments should not be construed to imply that ARTBA is against measures to clean the air and reduce energy consumption. We are not. We do suggest, however, that federal policy in these areas need to be carefully coordinated with federal transportation and tax policies. Thus far, that has not occurred.

As more emphasis is placed on environmental enhancement and energy conservation, we can anticipate larger numbers of cars powered by non-traditional fuels.

It appears that the transportation user fee based on gallons of gasoline, a concept that has worked well for more than three decades, needs to be revised. Some examination is under way into methods to determine and equitably assess a fee against all vehicles, regardless of what fuel they use.
For instance, there was discussion at the recent meeting of the Transportation Research Board of installing a "black box" on cars and trucks to measure distances traveled. Owners would be sent a regular bill based on mileage, whether they were powered by gasoline, diesel fuel or batteries.

This committee could take no step more meaningful to the long-term outlook for federal transportation programs than to order a comprehensive study to produce recommendations for putting the Highway Trust Fund on a sound financial basis for the next several decades.

In devising a financing mechanism for surface transportation programs, the federal government must keep in mind the needs of the states, who must raise funds themselves to match federal allocations and carry out other highway activities. The message from ARTBA members at the local level is to urge the federal government not to create a revenue system that hampers the ability of the states to raise money.

Mr. Chairman, for many years it has been ARTBA's privilege to work with Congress in designing the transportation programs that today provide Americans with the highest level of mobility on earth. We are gratified to be here today to discuss with you issues that may influence our ability to continue programs that are at the heart of the social and economic well-being of our country.

I would be happy to answer any questions the subcommittee might care to ask.

RECOGNITION OF NEW COMMITTEE MEMBER

Mr. CARR. I would like to recognize my colleague, Frank Wolf, for an introduction.

Mr. WOLF. Yes, the new member of the Committee is Ralph Regula. And it is kind of funny that I would introduce him, because many years ago I was a young person at the Department of Interior and there was this new Congressman named Ralph Regula, just elected from Ohio, and he called me up on the phone and asked me for some help and I came by and met him.

Years later, I ran for Congress, and I asked him to come to my fund raiser, and he was one of three Members who came in a driving rainstorm to the Mayflower. So it is an honor to introduce someone I have always looked up to. Ralph Regula, who is the Ranking Member on the Interior Appropriations Subcommittee. Ralph.

Mr. CARR. Ralph, we would like to welcome you. Of course, Ralph and I have served for many years together in the Commerce, Justice, State Appropriations Subcommittee, which you are apparently not on anymore, so I am delighted with the idea we will continue to work together.

Mr. REGULA. Well, thank you, and I appreciate the welcome to the Committee. I really do look forward to serving on this subcommittee. I think transportation is one of the exciting responsibilities, these are arteries of the nation and the jobs and the economy are so directly tied to what happens with our transportation system.

I have always said we really make policy by the way we allocate our money, and, therefore, this is a vitally important Committee in terms of our future and in terms of building a strong economy.

We had the international prayer, the national prayer breakfast this morning with a 150 countries represented and about 4,000 people, and, of course, the President and Vice President were there. And people around the world look to the United States for leadership, and I am quite sure how we handle these problems becomes a model for others.

I have to go to a luncheon, I apologize, where they have a number of our guests from other countries and they may have some questions, so now I will be well equipped to answer them.

ECONOMIC RETURNS OF INFRASTRUCTURE SPENDING

Mr. CARR. Well, I appreciate your being here.

Turning to the questions. Dr. Aschauer, I really appreciate your testimony and have read your writings over the years. The last sentence on page two of your prepared statement, says that wise infrastructure spending can offer economic returns. Putting that together with some of the comments earlier from the first panel and Dr. Taylor, on the need to try to develop some criteria. As I said then, this hearing is really a plea for help.

If we are not to be accused of politically driven result-oriented pork barrel, whether by demonstration project or by formulas that contain pork barrel or at least pass pork opportunities on, as Dr. Sanders has said, to local units of government for pork purposes, the question is how do we do that? How do we get the measures and the criteria we should use to make wise infrastructure spending?

I am impressed by the degree of consensus here about some things: One, that we should keep our eye on long-material investment, sustained levels of effort. I am somewhat impressed—I didn't really quite expect to see the degree of unanimity on the idea that the short-term stimulus may be unwise inherently or may be filled with some pitfalls which wouldn't fulfill its promise.

I am getting to that key question of criteria. We talk about cost benefit analysis. Where does a fellow like me go for a cost benefit analysis on an airport from Mississippi—got a letter yesterday from a colleague on that one—and compare that with a bridge project in the Outer Banks? Where do I, as a Member of Congress, go to get some help? Where do I get the cost benefit analysis?

Dr. TAYLOR. Let me just start with formulas, cost benefit analyses too certainly have opportunities for being skewed however one wants, but in order to compare across modes you have to use, you have to look at a fairly broad definitions of benefit.

I suggested some of those benefit categories, time savings, operating cost savings for vehicles, the border delay situation that Congressman Coleman spoke of is a good example of where you can quantify the benefits of reducing those delays.

We have similar problems, as you and I have spoken about, on the Michigan/Canadian border where we have long delays of trucks and far more trucks than there are on the Mexican border. But you also have to look to a very nebulous area which is benefits to the overall logistics and distribution system on the freight side. And we have made progress.

When you talk about productivity, transportation cost as a percentage of GNP are down over the last ten years. A lot of it from institutional changes not from infrastructure changes necessarily. Inventory as a percent of GNP is down a couple points over the last ten years. So there has been substantial improvements. But your question is a difficult one in terms of where you go to find—obviously, the applicants have to submit, I think, too, what they believe the benefits are and submit that cost benefit data to the decision-makers. But it is not an easy——

Mr. CARR. Dr. Aschauer?

Dr. ASCHAUER. Well, I guess I would want to differentiate between what we might like to be doing from a research perspective versus what we might be doing from a policy perspective given the state-of-the-art.

I think that the empirical evidence on productivity impacts of various public investments, transportation specifically, is strong enough to lead one to be, to have the belief that the benefits that are being captured by conventional, what I would call partial equilibrium cost benefit analysis, are not capturing the full range of the benefits from the transportation deficits. There are networking effects and logistic effects that are inherently very difficult to capture given the standard tools that are used in the cost benefit analysis.

From a research perspective, we need to be, as economists, looking into this area in much more detail to try to develop the tools that will allow us to capture some of these nebulous general equilibrium effects, if you will.

A policy perspective, I think that there are results from cost benefit analysis which right now would rationalize a substantial increase in public investment. As we heard from Dr. Ruane, just to maintain current quality of transportation, surface transportation infrastructure, would require an additional $15 billion of expenditures.

So that there is room in there to be increasing public investments wisely using standard cost benefit analysis, and yet from a longer-term perspective, trying to rationalize the larger benefits that seem to be arising when we look at the issue from a macroeconomic perspective.

JOBS CREATED BY INFRASTRUCTURE SPENDING

Mr. CARR. Well, you know, we need this help and you point out the difficulties of the measuring process. Let me take one that has just sort of boggled my mind, and Dr. Ruane's group has an ad that is currently in the newspaper that says that there is a ratio of about 50 jobs per every $1 million of infrastructure spending.

Dr. RUANE. Yes.

Mr. CARR. But, you know, those of us who are trying to do the right thing without any axe to grind, the Bush administration's testimony was that it was about 55 jobs for $1 million of spending. There is an outfit called Apogee Research, Inc., that found there were about 40 jobs for every million in infrastructure spending. APTA says there is about 58 jobs, and then we have the Congressional Research Service, which issued a report less than one month ago, estimating 24.3 jobs.

Now, the other day I was at a Democratic caucus meeting in Johns Hopkins and they were throwing up 60 jobs. I think that came from some things that IRA Magaziner had said. I am dumbfounded. What is it?

I understand there are different ways to measure these things, but those measures are not put out in the ads or the literature or whatnot, and it leads to great confusion about what we are getting. If jobs are what some people want to grab on to as the criteria as opposed to the long-range economic benefits, which I would prefer, then what are we to believe? How did you get your number?

Mr. RUANE. The 50 figure, our source is the Department of Transportation. That is their estimate, Federal Highway Administration, as to one billion would create 50,000 jobs. The range is really based on what kind of multiplier they have used and you will find that in any development project, you will find people disagreeing on that. And I think it goes back to what the assumptions were in the economic model they used to do the forecasting.

I am surprised at the CRS number being so low, given the others are all between 40 and 60. Again, I am not familiar with that specific one, but I think it is fair to say the range of 50,000 jobs, most of the research I have seen on this justifies that.

And I would like to comment on your earlier point, if I might at this time or otherwise. On the investment, I would suggest, again, why do we stress the National Highway System? It is again 75 percent of the freight traffic is on the National Highway System. 40 percent of all vehicle traffic is there. Even though it is only 4 percent of the roads, most of the economic activity is taking place on that system. That in and of itself, I think, commands—that should be a criteria in looking at some of these projects.

Are they related? Are they tied in in any way? Do they connect? Is it a port project that ties into the National Highway System? Is it an interchange, a bridge or whatever, that relates to this system?

The States are required under the new legislation to have comprehensive transportation plans, what they are doing right now. Again, the projects, when they are submitted to you, are they part of that plan? Do these projects have the sign-off, now that metropolitan planning organizations now have a major role to play in transportation planning? Have they received the endorsement?

And, lastly, something that is often missing in this kind of analysis is, do these projects in any way reflect the input and the priority of the customers? Has the local business community or the statewide business sector been part of this process, and not just the estimates of engineers or local officials or whoever? Are the actual customers who are going to use that system, did they have a role to play; do they endorse this project?

We ourselves at ARTBA do support the use of cost benefits analysis but at a macro level, it smacks of centralized planning. You will find a lot of resistance as you know in Congress to really initiate a comprehensive approach to this. But I think on something that has a striking national interest, like the National Highway System, that is the define system of roads, et cetera, there can be common ground to support investments related to that.

USE OF PENSION FUNDS FOR INFRASTRUCTURE INVESTMENT

Mr. CARR. I have one question before yielding . I asked the previous panel, given the proposals, one of which was written up in Monday's paper, on pension funds. There has been some discussion that there be created either liberalized authority for pension funds to invest in infrastructure and/or some kind of quasi public-private infrastructure corporation that would go to the capital markets themselves.

Now, do you think that is a good idea?

Dr. ASCHAUER. The previous criterion is the correct one. The issue is whether or not rates of return on displaced private investments would be greater than or less than rates of return on public investments.

I would state that it is my opinion, my feel for the empirical results, that there are public investment projects which are capable of yielding a high enough return to be rationalizing the use of pension funds with the possibility of one-to-one displacement of private investment. There would still be a net gain to society as a whole. But I would be very cautious in that area.

Mr. CARR. And, again, it comes back to guaranteeing that that is the right project or group of projects. And frankly I have, as an appropriator, have little confidence we are making that correct decision to meet your criteria.

Dr. TAYLOR. Mr. Chairman, as you know, one of the arguments is that if the private sector is involved somehow and if there is bonding for instance involved, the bond council will exercise their fiduciary responsibilities and appropriately determine whether or not a project will make sense. It will provide adequate return and so on.

My experience with bond councils is that bond councils are basically working on behalf or as commissioned salespeople, to be blunt. And as soon as there is a public guarantee of any type, that bond council will spend about one page on an analysis on the market forces and whether it is a good project, and ten pages analyzing the public guarantee, and if there is a decent public guarantee, which all these proposals tend to rely on, that is it. They will not do their fiduciary, they will not do their job, and they will just immediately have recourse to that public guarantee and that is what they are looking for.

Dr. SANDERS. Mr. Carr, if I might—I remain somewhat mystified as to what the purpose of such an alteration in pension system is seeking to do, simply put. We have a system already at the State and local level that requires a political test in a great many cases for most every American State for public investment, and that is whether it meets the regard of the voters at the ballot box and their willingness to take on increased debt and whatever tax burden is involved in that particular project.

If the intent is to avoid going through that test, that is to make public capital available without the concomitant commitment of a revenue stream to repay it, or to allow States and localities to manage investments that would under other circumstances be unacceptable to their electorates, then I have a great many questions about it. It offers an enormous political boondoggle, if you will.

On the other hand, what we have seen in recent years is that the bond market and the electorate is quite willing to pick and choose among projects and among investments. This last November we saw substantial support at the ballot box for bond and debt proposals for infrastructure investment in a variety of public investments. At the same time an $800 million program in New York was soundly and singularly defeated.

So we have a real question. I don't think it is an appropriate role for pension funds to serve as a device for going around the public's wishes, quite frankly.

Mr. CARR. That is an interesting perspective.

Dr. SANDERS. If there is public support, I suspect we can find a good many mechanisms for carrying that out, pension funds are one possibility.

Dr. RUANE. I think it perhaps goes without saying some of the interest stems from the fact some of the pension funds being discussed are for unions whose members would gain jobs if these there were additional projects, and I think that is the real world aspect of some of these proposals.

At the same time, I would note that given the shortfall in funding that we have and the known needs, that this idea deserves intense scrutiny by the Congress and the administration to see whether it can meet the tests that have been identified here today. I do know there will be some very serious changes in the law because some of these are tax exempt situations that for them to get into this game there will be some major changes necessary, but our view would be if these are explored as additive sources of funding and support for infrastructure, they are worthy but not as an actual replacement to the existing financial source, primarily the excise tax.

Mr. CARR. Congressman Price?

Mr. PRICE. Thank you, Mr. Chairman. I want to thank the entire panel for a very useful discussion. First, I want to turn to you, Professor Sanders. I enjoyed your recent article in The Public Interest. It was a very deft job, I thought, of puncturing some of the elements of the conventional wisdom in this area. As is often the case with articles in that journal, it perhaps did a better job at puncturing the conventional wisdom than in revealing your own positive bottom line in terms of what our policy ought to look like.

I suppose I would like to try to bring that out a bit in this question.

STRUCTURALLY DEFICIENT BRIDGES

I want to focus on what you said specifically about structurally deficient bridges and about the distribution of those problems and how they are concentrated in certain areas.

You say in many ways this appears to be a local rather than a national problem and you cite that the worst four States account for an astounding 31.4 percent of the national total of problematic bridges. So you conclude that a major spending program in this area would help a few poorly managed States but only at the expense of others that have done a fairly good job of maintaining their own bridges and highways.

Now, you raise an important point, especially for a state like mine, North Carolina. This is a State that has traditionally been a donor State in the Federal highway program and has also done a pretty good job with bridge maintenance. New York, which has the most deficient bridges, hasn't raised their gas tax from 8, 9 cents since 1973. In contrast, my State has raised the gas tax from 9 cents in 1980 to almost 22 cents in 1990.

So you point out an infrastructure package that would give the most bridge money to what are admittedly needy situations in New York, while that might address the most pressing needs, it would represent a perverse incentive to continue to be irresponsible in terms of their own pattern of taxation and bridge repair.

If we are going to meet these bridge needs, how do we go about it to ensure, first of all, that we meet the needs but at the same time we don't do something that is terribly inequitable or that offers perverse incentives to the States to do their own part and take care of their own needs? This strikes me as a considerable dilemma.

I wonder what your answer is and also if other members of the panel would have anything to contribute about this assessment of the maldistribution, so to speak, of the deficiencies we are talking about and the very difficult problem of how we overcome that in designing a national program.

Dr. SANDERS. If I might, just very briefly. Working in a terribly complex Federal system, it is clear that lots of things end up happening in terribly peculiar ways that are often different from what we start out to deal with or solve. There are some policies, however, that suggest themselves as ways to deal with this problem in particular that you have mentioned.

For example, the existing highway bridge program allocates its funds, in large part, on the basis of needy bridges. That has a terribly perverse incentive to encourage States to let bridges get and stay bad on the assumption that they will sooner or later become eligible for Federal aid, as well as generating for the State an increased share of the HP or RP funds.

Mr. PRICE. That makes a lot of sense just on the face of it. What evidence is there that those apparently perverse incentives really do have that effect?

Dr. SANDERS. A couple of quick things, and we can see, in particular, with a very high match rate, on the order of 80 percent, it often makes a great deal of sense to let things get bad enough that you become eligible for rehabilitation or replacement aid rather than trying to solve problems in a much more cost-effective way, particularly when maintenance expenditures are 100 percent, State or locally matched.

So one simple thing that suggests itself is to reduce that matching share to a level that requires a greater local commitment, State or local commitment.

Another alternative has been suggested by Ed Gramlick at the University of Michigan, formerly with the Congressional Budget Office, as we begin to rethink the way we give aid under the existing system. For example, if what we seek to do is to encourage States to invest in maintenance and repair and capital renewal and rehabilitation, we might well shift to a system that matches their spending or their spending over, say, the last four or five years as a way of saying, don't let the problems accumulate. We will give you more money from Washington to the extent that you generate a higher level of resource and renewal investment at the local level.

Now, we have some grant programs that, in fact, did such calculus and generated that kind of result, most particularly in the Housing and Community Development Act. But that suggests itself as a way to encourage States to generate more funds of the appropriate sort to deal with those bridge problems rather than facing this terribly perverse incentive of waiting until things get so bad that Washington will provide the bulk of the assistance.

Now, that is not to suggest that State or local officials are making bad decisions. It is to suggest that faced with fiscal constraints, it probably makes a lot more sense for them to wait, on the assumption that sooner or later things will get bad enough that they can be saved a great deal of the cost.

That is one particular approach to this kind of thing, particularly in an environment where what we want to stress is renewal, rehabilitation, maintenance of the existing system rather than incentives to construction of entirely new facilities or major capacity enlargement.

Mr. PRICE. Good. And I do want to move on to that broader question about the payoff of maintenance investments as opposed to new construction. But first, I wonder if any of the other panelists have a comment on this present question?

Dr. RUANE. Mr. Price, looking at my notes here, I see that 3700 of the bridges you refer to structurally deficient of the over 100,000 that are in this category are, in fact, on the interstate system. It would seem to me that they are the ones that should get the attention first. And if my memory serves me right, I believe in the Senate debate with ISTEA, I think it was Senator Byrd who actually made a suggestion that there be some kind of reward system based on the level of effort, really the level of the gas tax that various States had and some evidence of what they were contributing to take care of the problems as having some impact on the Federal aid. That did not survive, if I recall that correctly. But that was debated and that is one way of dealing with this issue you raise.

Mr. PRICE. Let me just refresh my memory, if I might, Dr. Sanders. In your article, did you not divide that universe of deficient bridges into more and less serious cases? Could you fill me in there? That interstate number puzzles me.

Dr. SANDERS. The interstate number puzzles me as well. There was a breakdown of an FHWA need estimate by the type of bridge. Since FHWA provides its statistics in its own peculiar sort of way, that figure referred to all structurally—bridges classified as structurally deficient on the Federal aid system.

The number Dr. Ruane mentioned doesn't ring a bell, unfortunately, but I would be glad to flesh it out for you, if I might.

Mr. PRICE. Maybe we just need to straighten this out for the record afterwards, but in your article you say very little of this total involves structures on the interstate highway system. Interstate bridge needs come to only $3.5 billion, quite a manageable amount at a time when Federal highway spending alone comes to more than $16 billion annually. Looks like you are working from different lists.

Dr. SANDERS. It is entirely possible, and if you would like, I would be glad to try to sort that out with Dr. Ruane a little later today.

Mr. PRICE. You can do that either separately or together.

Dr. SANDERS. Indeed.

Mr. PRICE. But it would help to know how you would account for that disparate statistic because, obviously, if a third of this is on interstate.

Dr. RUANE. No. It is not a third, it is 3700 out of 100,000. Not a third, but less than 3 percent. The structurally deficient bridges under Federal highways classification in their most recent report is some 118,000 bridges.

Mr. PRICE. Perhaps I misunderstood you. How many of those are on the interstate?

Dr. RUANE. 3700 out of the 118,000.

Mr. PRICE. All right, good. I thought you said 37,000.

Dr. RUANE. No, sir.

Mr. PRICE. So you are perfectly consistent then. Mainly this is a local problem.

Dr. SANDERS. It is a non-interstate problem and a substantial part of it is off the Federal aid urban system, off the Federal aid system.

COMPARISON OF HIGHWAY MAINTENANCE AND NEW CONSTRUCTION

Mr. **Price**. Good. Thank you.

Well, let me ask just, in terms of maintenance and new construction, you probably picked up some of the discussion in the last panel on that topic—CBO has provided us with an estimate that, at least in the highway area, the most persuasive economic return would be for maintenance activities with a much smaller return for new construction projects. In the opinion of the witnesses, do you agree with that and, if so, would it make sense to limit or target additional funds to maintenance activities?

And then let me ask you also, as we look to intermodal transportation, are there other areas outside of the highway system that offer a similarly high return, a high economic return? For example, spending on high-speed rail, would that bring a large economic return, introduction of new trains or development of the high speed rail corridors?

Dr. **Aschauer**. I would not have any fundamental disagreement with the Congressional Budget Office assessment that returns to maintenance expenditures are in the 40 percent range and substantially higher than those in new construction. But we do run the risk that the tools which are being used for such assessments are inherently biased in favor of finding higher return for maintenance activities than for systemic network type activities, which would involve new construction.

That same point would—should be made for looking at the broad returns to high-speed rail; that these are, the returns are inherently broader than we would expect from maintenance expenditures and may well not be fully captured by traditional cost benefit analysis:

Mr. **Price**. Other comments?

Dr. **Ruane**. I don't have any empirical evidence on the point you made regarding maintenance versus new construction, but I would just point out that the new—the ISTEA, the new legislation, there is a built-in bias against adding capacity, which would effectively be encouraging maintenance of existing facilities, and that is because of the Clean Air Act and particularly in urban areas.

The large urban areas there is a disincentive, in fact, very difficult to add capacity unless it is of a—for an HOV lane, high occupancy vehicle lane.

So in the process of authorizing the new legislation, some of these decisions have already been made and they were driven more by the Clean Air Act than they were by the transportation considerations.

Dr. **Sanders**. No, the CBO's analysis strikes me as terribly persuasive. At the same time, it also suggests that given our larger environmental concerns, that it avoids some of the problems that we have managed to build ourselves into over the last 40 years in terms of creating new capacity and encouraging ever larger outward growth and dispersion of workplace and ever greater demand for automobile usage.

So it is a fairly substantial case. It is quite clear, however, that there are a good many circumstances at the state and local level that propel entirely new construction and capacity addition, in part because that, again, the politics of economic development and the sense that one is contributing to private job growth in a specific locality is awfully encouraging.

It is clear one way to get at that is, again, to require a fairly substantial State and local fiscal commitment to these kinds of projects as a way of avoiding placing much of the fiscal burden on the Federal Government with much less inherent accountability at the State level.

Dr. **Taylor**. Let me just add that I would like to reiterate the comments about the Clean Air Act. I think you will find the Congress probably having to readdress some issues here in a couple of years when constituencies begin to find out what the Clean Air Act does in terms of stopping all new or a good deal of highway construction. I don't think people understand that fully yet.

So there really isn't any choice. Most of the money is going to have to go into maintenance kind of projects. I would also say a lot of our needs in addition to National Highway System, including border areas and port access and so on in the National Highway System, are suburb to suburb kinds of congestion problems in major urban areas, and with the densities in most of those kinds of areas, light rail, for instance, is extremely difficult.

And the costs of all the rail projects that you see if you look at them on any kind of cost-effectiveness criteria, are just completely out of the ball park in terms of being of any kind of viability to them for many, many years.

Now, there may be other reasons to fund those kinds of projects, but you cannot justify them, I don't believe, from the data on cost-effectiveness or—and it is unlikely I think you can justify them on a cost-benefit basis.

READY-TO-GO CONCEPT

Mr. **Price**. Let me just switch back quickly and finally to the stimulus aspect of this and again recall the discussion in the last panel. Dr. Ruane, I suppose I would especially like to give you a chance to respond to some of the things that were said about the ready-to-go concept and the kinds of projects that our State people at least think they have ready to gear up in relatively short term.

Of course we welcome the comments of the rest of you also on the general question of how much of a stimulus all this might be able to produce in short order.

Dr. **Ruane**. Well, I would, for background, point out to the Committee that AASHTO initially released a survey in early December, and this one that was just released four days ago was done primarily as a result of a request from the new administration to—because they expressed some doubt as well, I understand, that these projects get rolling as quickly as everyone is asserting.

And so when they did their survey, they laid out four criteria, if I might just quote. The one is: Can they be initiated in 30 to 90 days from enactment of the legislation; that they are of a noncontroversial—and I think that implies environmental issues.

Mr. **Price**. Those hurdles have been cleared; in other words, those regulatory hurdles.

Dr. **Ruane**. Yes, sir. They can provide a short-term economic impact through job creation; and they will have long-term economic benefits.

We ourselves in our own survey back in November from local county roads officials had similar criteria and the evidence that came back—and I would have to defer to that organization—the sources are the respective 50, you know, transportation departments, that the work is sufficient, it is prepared, the clearances have been obtained, that it can be undertaken within this time frame: So I would give credence of course to this study.

Mr. PRICE. Any of the rest of you had a chance to examine this question?

Dr. TAYLOR. The limited research I have done on it, just talking to people in State highway departments, would be that just the contracting process alone and the rules and regs and getting the contracts out and you might be able to speak to that a little more in terms of the number of days it takes to get out requests for bids and to get bids and to handle protests and so on and so forth is a problem.

Dr. RUANE. I think there is validity to what he says and implicit in all of this, and I am sure at least my recommendation to the new Secretary of Transportation, is that they waive a number of these requirements, not environmental requirements, they cannot waive laws, of course. But some of the regulatory and processing time is subject to discretion of the Secretary and it can be expedited. That is not to say some of these projects will not experience some kinds of delays. But I think we have to go on the judgment of the experts here as to when they can get the projects under way.

I can speak more with more authority in regard to the ability of the industry as a whole, the private sector, to respond to this stimulus in terms of the construction work force, the machinery manufacturers, the suppliers who provide the aggregate, the asphalt, the concrete, the steel, the engineering community, if there is further design work, or construction management work needed, that those segments of the industry, there is enormous excess capacity.

And in evidence to this, I think perhaps for a perspective, if you look at this very committee over the last four years, we have had a 40 percent growth in appropriations for transportation, particularly highways, and the States have absorbed that readily. This past year there was a significant jump in the amount of money that they had and they did obligate all the money by the end of the fiscal year.

They did, however, experience difficulties in the early months, and the press picked that up. That was widely covered in some of the national newspapers. And that may still be lingering in your mind, but the States did in fact, by the end of the fiscal year, obligate every amount of the money they were given.

Mr. PRICE. Well, there are those news accounts lingering in our minds, perhaps. There is also some pretty solid evidence, according to Dr. Penner, that there have been difficulties in the past fulfilling these predictions of quick start-ups and quick economic effects.

You think the circumstances are substantially different now?

Dr. RUANE. Well, I am familiar, having—I was in the economic development community back in the 1970s and have some practical experience with Accelerated Public Works, and I know that there is a lot of validity to his assertion. And I can only say that, hopefully, and I can't say this with absolute authority, that the circumstances have changed, because the level of investment has grown significantly in recent years, the State Transportation Departments are gearing up for this, that this was a proposal last year, of course, that we had a $7 billion program.

So this has been percolating for over a year and, hopefully, the States, knowing the level of investments available through ISTEA, are better positioned to absorb this new investment.

Dr. **Sanders**. Just very quickly, we would be glad to provide you with the figures from the local public works program experience in the mid 1970s. It suggests it takes a while to get these things going, and most of our experience since then on smaller-scaled public works activities, suggests much the same thing.

I looked briefly at LPW's experience in terms of job creation and that suggested in excess of 70 percent, my recollection is, about 72 percent of the jobs created were construction jobs that were created for skilled labor. Part of the problem or question we want to ask is: Who are we trying to give jobs to, do we want to concentrate on the kinds of projects that are likely to use a relatively higher degree of on-site labor as opposed to projects that are relatively capital and design intensive, and do we want to concentrate on projects that use a relatively high proportion of unskilled labor, where we have a much more serious set of economic problems and social problems to deal with.

In some sense, I am talking to the wrong set of folks. It strikes me when we talk about these sorts of needs, the kinds of things we should be talking about are relatively small scale, often highly local neighborhood street resurfacing and improvements projects that will give us a lot of spending for relatively needy folk fairly quickly.

The experience in LPW was that, in the second round, that funds could and were targeted to areas of higher unemployment, but frankly, personally, I would much rather see funds targeted to folks who most need them in our current circumstances. And that, for me, oftentimes, suggests not going the route of funding large-scale reconstruction or bridge rehabilitation programs in favor of what might almost be maintenance, labor intensive, kinds of resurfacing projects, often at the local level that might typically be done through the mechanism of the Community Development Block Grant program.

Mr. **Price**. Well, that is interesting, and it would be most helpful to have whatever comparative kind of data you can furnish.

Dr. **Sanders**. Certainly.

Mr. **Price**. And, of course, it would be even more useful if you could help us relate that to our own circumstances. In other words, if you could highlight the kinds of continuities or changes you perceive between these earlier experiences and what we face now.

Well, thank you, Mr. Chairman.

AASHTO NEEDS SURVEY

Mr. **Carr**. Thank you. If you would yield on your point. I have to say, and I have looked at these, and coming back to the AASHTO report again, it would seem to me, if I was a governor of a State, it would be politically unacceptable for my Director of Transportation to say we would have difficulty using money. As a political proposition, that would be unacceptable.

Dr. Ruane. Yes.

Mr. Carr. Now, Hawaii is a special case. I imagine somebody's head rolled in Ohio.

Dr. Ruane. Yes.

Mr. Carr. I would like to find that out, but it seems to me that we cannot rely on the AASHTO document that is a political document and, in my judgment, not a technical document. Not altogether unhelpful. I didn't say that right, but you know what I mean. It is helpful to have some of these things identified.

I look at my own State, not to pick on anybody else. I don't know all the projects there, but they are all under way. I mean these projects here—and I think if you read the Michigan statement, it is general and it is vague—and what this additional money might do in a state like Michigan, it might help them reschedule some other things that are going on there locally that we don't know about here.

There may be other delays that are induced in the process by an environmental or some other thing we don't know about which this money will—because that money is committed, it will be obligated later instead of sooner—this might enable some flexibility, some functionability. I doubt if it will create any long-term job creation.

Congressman Wolf.

ASSESSING THE NEED FOR STIMULUS BILL

Mr. Wolf. Thank you, Mr. Chairman. I want to thank you for having the hearings.

Coming down today, I was at a memorial ceremony at the CIA and the 11 clock news indicated unemployment is dropping and the economy is picking up.

I initially was opposed to a stimulus. After hearing most of you today, I am pretty much sure that I am opposed to stimulus spending. Nobody has talked about the deficit. I have five kids. We are destroying this country and their future, if we just continue on this path and I think you understand.

So let me ask about this. It seems to me—and I heard somebody the other day say the unemployment rate in the country is about 7 percent—if you take out California, it is even better. California is about 7 or 8 percent of our economy, and if you remove California where the economy is doing poorly, we are doing relatively well.

If that is the case, and an economic stimulus could help create inflationary problems or certainly increase the deficit, if you were Members of Congress, and the Clinton administration sent up a $20 billion spending request, would you vote for it? Just briefly, a yes or no and why in one or two sentences.

Dr. Taylor. No, I don't believe it is needed and it can't be spent soon enough to make any difference. It will be spent at a time when it will do more harm than good and it will create—in fact, its purpose has nothing to do with transportation. It is more of a social services issue.

The kind of projects that will be done in the short term very quickly or they will try to do in the short-term very quickly won't be the kind of projects that will contribute to productivity or competitiveness.

Dr. **Aschauer**. I would say of that magnitude, I would also say no. That $20 billion of productivity enhancing projects to be found in that period of time would be very difficult.

Dr. **Sanders**. Quite frankly, the prospect of a fiscal stimulus package is driven by politics. It is important the President look like he cares about those who are unemployed and this is a vehicle for doing that. Given that political need, it may well be necessary for Members of Congress to vote for it. But that suggests first it be kept relatively small and second that it be targeted; that is, either target it as LPW was largely to areas of unusually high unemployment to the extent that is politically feasible or specifically, as I just mentioned to Mr. Price, target it in ways that aim to help the most substantial needs out there in terms of unemployment.

The likelihood, quite frankly, is that you will find substantial substitution. Congressman Carr noted what we will likely do is simply move ahead or be more generous in the Federal share of projects that would likely have happened anyway. Economically, its justification is terribly limited. Politically, it is a very different circumstance.

Dr. **Ruane**. I would perhaps be the voice crying in the wilderness here. I would vote a very strong yes and for reasons perhaps beyond the discussion today. One, as far as transportation goes, is that one has to go back to whether there is a need in the first place. And if the investment is for transportation where there are identified needs and not for repainting the murals in some city hall, that there is not only going to be stimulus from the immediate construction or reconstruction aspects, but long-term gains as we reuse that facility time and time again, be it an airport or a road, or whatever.

Mr. **Wolf**. Very quickly, yes or no, if you did one of these, would there be greater danger of corruption and waste?

Dr. **Taylor**. Yes.

Dr. **Aschauer**. Yes.

Dr. **Sanders**. Corruption, probably not waste, yes.

Dr. **Ruane**. I am not sure I could answer that question. I would probably say no to both. I would hope it would be no to both.

Mr. **Wolf**. I think, Dr. Sanders, you raised something. This *is* a political process. When I came to Washington years ago, I had an image of Washington that I gained really from the Huntley-Brinkley Show. I thought it was the alabaster white monuments and I found out it is a very human process, it is a political process. These projects are based on—and that is why I am pleased the chairman did this hearing—"What lobbyist have you hired?"

Let me say there may even be a lobbyist in this audience. I used to be a lobbyist before I got elected, so I am not being critical, but it is, "Have you retained a lobbyist? Who is your member, and is he on this key committee?" And I am sure that there may be a project in a little town that really needs it and they cannot afford a lobbyist. Yet the project that is so obviously pork is approved. Do you have any——

Mr. SANDERS. I am a native Washingtonian. I grew up with this and it doesn't surprise me in the least. It is the way this town works.

The reality is I am a big fan of Federal spending. It has taken ample care of me and my family. My father worked for the Federal Government for 30 years. The question is: How can we do a better job and more focused job of taking care of some particular policy needs? And that is my concern here.

I think there are infrastructure needs out there. What I want to see is a set of policies that we can manage to take care of them with. I hate to see what invariably happens in this kind of circumstance, which is that either a fiscal stimulus package or a long-term public investment policy gets wrapped up in a much larger rhetoric that promises things that are not likely to happen and then deflect from the nature of the political system. Political scientists don't call it pork but distributive politics. It is the way legislation gets done.

Mr. CARR. I like that.

Mr. WOLF. What troubles me——

Dr. SANDERS. But there are ways to structure that kind of politics to make sure that the places that are needier get a relatively larger share. And that is what we have done in a number of cases and that is all I would suggest this committee give some thought to.

Mr. WOLF. There is a project in my area that I no longer directly represent, but it is to develop mass transit in the Dulles corridor coming in from the West Falls Church subway stop out to the Dulles Airport. There is a desperate need for more mass transit, and the State has done a good job with regard to the toll roads.

I wanted to ask you generally your comments and perhaps you can tell me later your feelings about toll roads and roads like that. But I have helped this area secure funding for an express bus system. However, the State wants to proceed immediately with rail so they have secured a "letter of no prejudice" from FTA so they can proceed.

Here we have gotten money for buses that can go into the town centers and go into the neighborhoods and come back on the corridor expressway. But $6 million is also being secured to prematurely study rail in the same corridor, which has already been studied 4 or 5 times with about $3 million in federal funding.

There is no excuse, no excuse whatsoever, for my State to be pushing for a light rail/Metro study in the Dulles Corridor when we have already studied it and when they could be putting that $6 million into buses to bring service immediately to the neediest people. Bus service would also help build ridership for future rail service in this area.

Dr. TAYLOR. Your State is a poor cousin to Michigan and Detroit which has just gotten $20 million, I think, or maybe it has been reduced——

Mr. CARR. Not yet.

Dr. TAYLOR [continuing]. But is salivating over figuring out how to get around someone in here to study. The studies are getting bigger than what it costs to do the solution.

There are clearly places where light rail, subways, so on, I am sure they make sense in some places, but they are very limited places. We have some kind of phobia about buses that would do the job 20 times better, just to exaggerate, at a 20th of the cost. I'm not even sure it is an exaggeration.

Mr. Wolf. I was raised in Philadelphia. I am a great fan of rail and I have nothing against it, but when I looked into this subject, I found out that the commercial density that they would need for rail is so great that the rezoning issues alone would cause them to say forget it.

Let me move to this question Mr. Carr raised, because I would like to ask you to submit to the committee, for the record, and submit to me, a list of qualifying questions that you think we should ask all the witnesses seeking a "demonstration project." The goal to see should be to determine if a project is fair, open, honest, legitimate, and if it should be funded.

Could you come up with such a questionnaire or such a series of questions?

Dr. Ruane. I earlier—I would amplify on what I said earlier. Some of those criteria should be through these projects, are they connected through the priorities systems like the National Highway System ? Are they part of an improved state transportation plan? Do they have the support of the local MPO or the local area of government, and more importantly perhaps in the context of serving the customers, is the business community, are the people that will use this system, have they played a role in this and this is not just a pipe dream of some engineer or some politician who wants to see a new project?

Does it have these questions answered, and I think the debate and dilemma you have goes back to your question on corruption and waste. The States and the local governments want just about total flexibility. They just want a block of money they can spend as they see fit, yet the Federal Government and the Congress has rightful concern whether these investments are going to return long-term benefits to the economy and to our various transportation systems.

So somewhere there is a compromise in there and I think it is in order that the committee get into some of these kind of questions.

Mr. Wolf. But also if you all can submit for the record a series of questions, that would certainly be helpful to me, and, in fact, what I would like to do is get your questions, get the questions from the other panel, and submit those to each witness that comes before this committee. And before I vote, speaking just for one person, on the project, to see whether it meets the test.

I understand there are political differences and I think there are some projects that are perhaps needed that may not meet a cost benefit ratio because it is an inner city area or particularly poor area or an unusual opportunity. I am not seeking this to be so rigid that if every project doesn't match up, it falls out. I understand the world doesn't work that way.

DEGREE OF LOCAL COMMITMENT TO INFRASTRUCTURE PROJECTS

Dr. SANDERS. I am reluctant to propose some sort of review mechanism for this subcommittee that puts to work unemployed and underemployed economists rather than construction laborers or political scientists. No, we don't do this stuff. But I would suggest one thing, and it certainly has worked in the case of the Army Corps of Engineers and your colleagues.

To the extent that any such projects can pass a test of a real local fiscal commitment and a fairly hefty one, we have an idea of something that passes the test of suitability at the local level and with both local officials and local electorates. If folks come to Washington looking for something that they are unwilling to pay for substantially themselves, then we have a problem.

Mr. CARR. Would you yield on that point?

Mr. WOLF. Sure.

Mr. CARR. I don't disagree with what you are saying as an objective. One of the things that bothers me a little bit about requiring a greater match has a lot to do with the fact that the economy around the country is not even, never has been—if you are from San Antonio, and maybe you are getting rates of growth and you have flexibility in your tax base, there are certain opportunities there that might be easier on a larger match than if you are in, say Flint, Michigan.

I don't happen to represent Flint, but I represent Flint Township, where we have lost 50,000 manufacturing jobs, and on the blocks to go in the next two to three years are probably another 10 to 12,000, where there is a mass exodus of the tax base, and, yet, there is an infrastructure that is now, no fault of the remaining citizens of Flint, inappropriately sized but, nonetheless, needs maintenance.

A super match on them would just work an unfairness. I just want to throw that out because it is another level of sophistication in what we are trying to do here, but I generally agree they should come up with more money.

Dr. SANDERS. Clearly, there are cases that require a much more subtle adjustment in these sorts of things as a general rule, a greater local share is likely to lead to greater local thought and consideration. And there is often, though I can't speak directly to the case of Flint Township, I am familiar with Flint's economic distress. It is often the case that there is the capacity at the local level to generate more revenues for projects that look like they will accommodate these sorts of opportunities.

The one thing to note here is that we have a terribly perverse problem at the State and local level that often encourages development in one place as opposed to another.

Mr. CARR. I understand.

Dr. SANDERS. It is incumbent, I think, to do something about Flint and Flint Township's problems. I don't know that this Committee's jurisdiction and the grant system is the best way to do that, and there are some policies I would be glad to talk to you about at your leisure.

Mr. CARR. I thank the gentleman for yielding.

Mr. WOLF. Did you want to——

Dr. ASCHAUER. My thinking along that line would involve having more of an advisory capacity at the Federal level. Some sort of advisory board to be considering the quality of the demonstration projects—I don't think it can all be determined at the local level, with substantial spill-overs for many projects—that would render them reasonable from a national perspective, perhaps not from a local perspective.

Dr. TAYLOR. I can submit that kind of list. There is some work being done in this area. For instance, the Corps of Engineers is looking at—they are coordinating a multi-agency study right now that looks at the whole question of infrastructure benefit, but the Bureau of Transportation statistics is looking to do some studies in this area that get at specific criteria.

I think one of the best criteria is how much—doesn't have to be a lot of local match, and I am not sure what the policy has been on demonstration projects lately, but some local match. Even if it is 5 percent, it would go a long way towards weeding out bad projects. Even 5 percent or 3 percent or something. Even just some minimal amount.

And I agree with the comment about the national competitiveness benefits. An example I can give you, look at something like the Blue Water Bridge between Port Huron, Michigan and Sarnia, Ontario. Growth has doubled traffic. 800,000 trucks a year. There is some local benefit, but it is a major national competitiveness benefit in terms of north-south traffic flows between specialized plants that increases productivity.

That is one where we are probably going to do it as potentially a private, but maybe coming out of public authority, tolled project, and it will easily support the traffic there, that kind of approach. But there is very wide national competitiveness benefits in many of these projects that don't accrue as much to the local community.

THE GAS TAX AND TOLL ROADS

Mr. WOLF. When you do that, if you could address the national interest, too. You raise a good point; the national goals as well as the local. And again, nothing is going to be perfect and some areas just are going to need it. So I am not looking for a perfect system that you plug into a computer.

Two last questions: If you were a Member of Congress, would you vote for a gas tax, yes or no? If yes, would you use it for the deficit or use it for infrastructure?

And secondly, just a sentence or two on toll roads. We have a very successful toll road in my area that goes from basically Tysons Corner, out to Dulles Airport, well used, 85 cents for the full distance. We are trying to—the private sector is trying to—build an extension from there out to what they call Leesburg which runs the spine of my area. Fairly well-accepted.

So if you could comment on toll roads.

Dr. TAYLOR. On the gas tax, I would hold out for quite a while on the gas tax increase until I thought some efficiency improvement legislation had passed that deals with some of the environmental kind of things I talked about and the number of other issues that make us get very little bang for the dollar on our transportation infrastructure investment.

Once I was satisfied that happened, I would support some small gas tax increase. We have a gas tax, I think, of two-and-a-half cents that is scheduled to come off here down the road that you will have to be deciding whether to continue or not and, if so, for what purpose. So that is going to be an issue very much as you are pointing out.

Until there is some major improvements in the kind of bang for the dollar in that infrastructure system, I would not support a gas tax until that happens. Then I would look at it. And toll roads, I think, there is a number of opportunities. I think we need to do more to encourage that and with the new technologies is the key, most people can go through without having to stop, you don't have to cause congestion to make it work.

Dr. ASCHAUER. On the gas tax, I could support a substantial increase in the gas tax, because when we compare our situation to some of our major international competitors, the gas taxes are quite low. I would encourage, though, that Congress be looking more toward a broadly based consumption tax or value-added tax in trying to generate, say, $50 billion of extra revenue, and not on the basis of gas tax alone.

If you are generating extra revenue from the gas tax, a substantial percent of that should go to support the infrastructure improvements in the transportation area.

I think we should be looking to making use of toll facilities wherever it is feasible and as with was stated, it is becoming more technically feasible all the time. So I would be supportive of that.

Mr. WOLF. Thank you.

Dr. SANDERS. I favor a large increase in the gasoline tax.

Mr. WOLF. How large?

Dr. SANDERS. 50 cents and upwards. And at that kind, at that level, certainly disentangle it from the highway trust fund and use it for general revenue purposes.

Our European colleagues tax gasoline in a substantial way and invest that money in a great many other things than highways. Continuing to fund that almost exclusively, absent the decision in 1990 on that extra two-and-a-half cents, will lead to lots and lots of problems and, I think, inherent difficulty in carrying out the marriage between the Clean Air Act amendments and ISTEA in terms of an emphasis on maintenance and renewal rather than new construction.

As far as toll roads, we have not talked about it. There is some substantial evidence and analyses that toll pricing schemes offer us a real opportunity to deal with congestion in major metropolitan areas in a reasonable way. That might even require or demand imposing some sort of toll tax on existing facilities.

Mr. WOLF. On existing roads? I think that is against Federal law.

Dr. SANDERS. It is at this stage, exactly. That makes a great deal of functional sense, not necessarily a great deal of political sense.

The problem we face is a situation where it becomes possible—I don't want to exclude the Dulles case for you, Mr. Wolf, but where it becomes possible to build roads, not necessarily where it makes some sense, but where it is essentially defined by the interests of particular land developers, that is an inherent problem in the business of decision-making.

Roads do an enormous amount to alter the distribution and value of land, particularly undeveloped land at the urban fringe. If we set up a circumstance where we start seeing toll roads, multiply in not terribly well developed areas, we may be doing a great deal more damage than we would without supporting toll roads at all.

Dr. RUANE. Mr. Wolf, if I were a Member of Congress, I would be leading the charge for a gas tax only if it was dedicated for transportation purposes. And the reasons are: One, is the ability to pay is there, as evidenced by a number of surveys and public opinion polls, one of which I made reference to many in my own testimony; and secondly, because the need is there for additional resources to get the job done.

I would even go so far as to specify that a portion of this, a large portion of it, say 10 cents, be solely for the National Highway System . And I would also lead the charge against using it for non-transportation purposes, because if that happens, the ability of the Congress and the government to meet our needs is going to go out the window.

On the issue of toll roads, we strongly support the greater use of toll roads because of emerging technology and because also of emerging interest in the private sector for ownership of toll roads and airports and other transportation improvements that can be profit-making as well as serving the public interest.

It is not the total solution, but it clearly is part of it, particularly in densely populated areas where the traffic counts justify at that kind of approach.

Mr. WOLF. Well, thank you very much. I really appreciate your testimony. I wish that every state Director of Transportation would get a video copy of your testimony. I think you make a lot of sense and in a lot of areas. I am looking forward to getting your standard questions.

If there are any witnesses in the audience, they are going to be the questions at least for this year I try to ask about some of these projects. Because I am not an economist or an expert, and obviously there are differences around the country, but I think it would give us some idea as to what we should be asking to make sure we are funding only valid projects, especially with the deficit what it is. I was at the same prayer breakfast with Congressman Regula this morning, and at my table was a gentleman from Argentina. I chatted with him, and he said their economy was really taking off; that the inflation rate was only 17 percent. It had come down from 100 and some percent.

And then he talked about how they monetized the debts. They just printed money. If we get to that point where we monetize the debts and print money, as politicians not wanting to face the reality, this great country won't be precisely the same as it is. So as we do everything, whether it be for health care or for transportation, we also have to factor in the deficit and what it means.

Senator Rudman came yesterday to a committee I went to and he said that, if we were to take all the money that we spend for the defense, close the military down, turn off all the lights, shut off all the bases, we would still have a deficit this year. Then, if we were to take all the domestic discretionary spending for everything from air traffic controllers, to Food and Drug Administration, to all the good things that we really need for Head Start and health care, we would still a have deficit this year.

Obviously it is unacceptable for the country to continue to do that. But you can see the scope of the problem. I want to thank you and especially thank the chairman for having these hearings. They have been very helpful. Thank you very much.

GROWTH IN HIGHWAY PROGRAM ADMINISTRATIVE EXPENSES

Mr. CARR. Thank you, Congressman Wolf. I have just one concluding question and then a concluding comment.

Dr. Ruane, I am looking at highway statistics, 1991, supplied by FHWA, which indicates that of the four cost categories in highway maintenance and operation, being labor, material, equipment and overhead, that the overhead portion has far outstripped the labor, material, and equipment increases.

Intuitively that doesn't seem right to me. We should be getting more productivity out of overhead and administration than less. So they will share with you the page I am looking at and maybe you could help us with an answer to that.

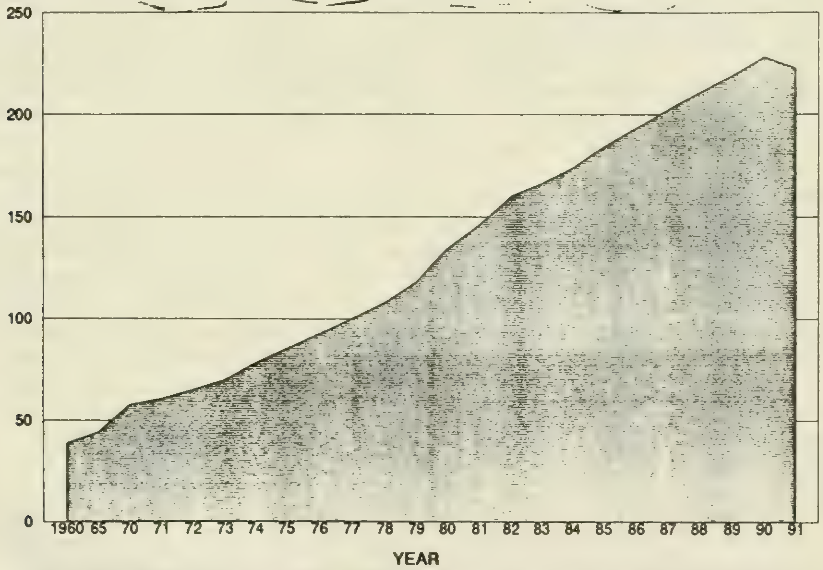
Dr. RUANE. Absolutely.

[Excerpt from "Highway Statistics, 1991" (FHWA PL92025) and response from Dr. Ruane follow:]

COST TRENDS
HIGHWAY MAINTENANCE AND OPERATIONS[1]

CONSTRUCTION AND MAINTENANCE DIV. TABLE PT-5
OFFICE OF ENGINEERING 1977 BASE YEAR = 100 SEPTEMBER 1992

YEAR	LABOR	MATERIAL	EQUIPMENT	OVERHEAD	TOTAL
1960	33.52	46.72	44.80	53.11	38.61
1965	40.44	48.96	48.53	58.05	44.18
<><><><><>	<><><><><>	<><><><><><>	<><><><><><>	<><><><><><>	<><><><><><>
1970	57.59	54.79	54.88	73.69	57.55
1971	61.20	57.91	55.59	77.45	60.46
1972	65.23	61.37	61.79	81.20	64.89
1973	69.87	64.35	68.86	84.95	69.86
1974	75.83	84.09	79.05	88.71	78.18
1975	81.72	95.60	87.85	92.46	85.24
1976	91.08	95.11	94.95	96.21	92.69
1977	100.00	100.00	100.00	100.00	100.00
1978	106.99	115.17	107.45	103.72	107.83
1979	114.51	136.26	120.84	107.48	118.17
1980	129.21	157.11	142.60	111.23	134.58
1981	136.96	159.31	167.84	130.36	146.29
1982	150.79	171.58	182.78	141.44	160.04
1983	157.58	170.04	188.06	159.40	166.28
1984	165.93	181.77	188.64	177.57	173.93
1985	176.05	194.68	197.13	195.86	184.37
1986	183.80	192.79	218.14	204.73	193.71
1987	192.30	185.27	232.36	220.05	202.53
1988	204.19	182.37	235.79	234.50	210.77
1989	209.63	177.59	254.43	256.10	219.09
1990	217.53	181.71	268.63	270.50	228.23
1991	217.88	185.83	237.91	278.16	222.63



1/ THESE DATA ARE PREPARED FROM THE UNIT COST INFORMATION SUBMITTED EACH YEAR BY STATE HIGHWAY DEPARTMENTS AND COVER BOTH PHYSICAL MAINTENANCE AND TRAFFIC SERVICE ITEMS, INCLUDING SNOW AND ICE CONTROL.

The chart on "Cost Trends, Highway Maintenance and Operations" found in the Highway Statistics, 1991 published by the Federal Highway Administration contains headings for labor, material, equipment and overhead. All of the information for labor, material and equipment is compiled from reports that state highway agencies file with FHWA for each federal-aid highway project.

The overhead rate is based on a computer model developed in 1947 and the information for it is not filed by contractors or state highway agencies as are the other categories. FHWA states that the overhead is salaries of supervisory personnel, other support staff activities and vehicles for supervisory personnel.

The overhead rate in early years was not keeping pace with the actual wage and salary rates because of the model and was adjusted from time-to-time by FHWA. According to staff in the Highway Engineering branch at FHWA, this is what caused the unusual increases in the overhead category.

FHWA advises that overhead will not be included in future statistics books published because the model is not valid and the information is not being used.

NEED FOR INVESTMENT CRITERIA

Mr. CARR. I want to join with Congressman Wolf. It is not his request—of course, he can make any request he wants, but it really is a Committee request that you help us with criteria, questions to ask.

Last year there was over $1 billion worth of requests of Chairman Lehman for demonstration projects. My recollection is that we had approximately $160 million available to spread around and I think we made some final moves in our markup to push that up to $170 or $180 million. I have the unenviable task, therefore, on a dollar basis, if things are steady state, to saying no approximately nine times for every time I say yes.

Unless I am going to get accused of being gross and pork barrel or political favoritism, this chairman and the entire Committee, Mr. Wolf, we are all going to need to have some kind of criteria which we are going to be able to apply to these requests so that we cannot take the politics out of politics, and we won't be successful, but at least we can guarantee the taxpayers, who once again told us they didn't want business as usual in the last election, and who do want us to do a better job of spending their money more wisely.

I am sure that when it is all over, that people like Brian Kelly and others who write books like this are not going to be put out of business, but hopefully we will do a better job with your help and we really do need your help because we don't have enough knowledge presently to ask the right questions and to put the right matrix on our decision-making process.

One possibility might be to require the demonstration projects actually be for demonstration; that is, let us demonstrate the cost benefit analysis of doing this versus doing that.

Incidentally—and I look forward to the testimony when it arrives—we did a demo, Congressman Wolf. It was an IVHS project that happened to be in Troy, Michigan and it has a university research component to it.

I am happy to say the preliminary results have tended to show that this particular IVHS project, again preliminary and not well scrubbed down yet, shows a 30 percent drop in traffic accidents in the particular area that is using IVHS.

So here is an example of a demonstration project that is actually demonstrating something. We are going to get real research and information out of it which can be applied throughout the United States and perhaps we need to do a little more of that.

In closing, I also want to thank my good friend, Dr. John Taylor, for highlighting one thing, and that is freight. The human ego would suggest as we analyze all these transportation projects that it is only humans that we are hustling around the country, and I would say that, even to those of us who are heavily involved in transportation, a lot of times freight becomes invisible.

The transportation of goods probably is more important to the overall productivity of the economy, many times, particularly in long-distance, than it is human beings. We have this egocentric motion that if we are moving human beings efficiently, then it must be okay. I thank you, John, for highlighting the freight component of that and I hope in our future hearings we will be able to do that.

You have been very patient. It has been a long hearing. Many of you were here to hear the last panel. Some from the last panel stayed. Thank you. You have helped this committee tremendously and we look forward to a continuing dialogue and relationship on how we can do a better job. Thank you for being here.

The Committee is adjourned.

Mr. DeLay and Mr. Wolf will have questions for the record and without objection, we will insert additional material from Douglas Holtz-Eakin in the record as well.

[Questions and answers for the record follow:]

Infrastructure Investment Cycles

Mr. Wolf. Some of the current debate on the subject we are examining today would lead you to believe that the "sky is falling" on our nation's infrastructure. It is true that spending decreased after the peak period of the 1950's and 1960's. But during that peak period, we were building an interstate highway system and expanding schools for baby boomers. Granted, we have some new challenges today such as congestion in urban areas, such as the area I represent. But, wasn't the leveling out of spending after the peak period of the 50's and 60's evidence of a normal cycle rather than a disinvestment in our infrastructure? I hope no one is contending that we should accept peak spending periods as the norm, since that is how we arrived at the mess we are in today.

[Response from Dr. Penner follows:]

It is not surprising that infrastructure spending leveled off after the 1950s and 1960s, since that was the time of peak spending on the interstate highway system. It is also important to remember that part of the slowdown in the late 1970s and early 1980s was the result of President Carter's politically courageous effort to end wasteful spending on water projects in the West. What I then regarded as a triumph of good budgeting is now described as indicating the neglect of our infrastructure.

[Response from Dr. Hulten follows:]

The Interstate Highway System was built to during the 1950s and 1960s, and schools were expanded to accommodate the baby boom. It is hardly a sign of neglect that spending declined as these programs wound down and the country grew into its newly enlarged capital stock. To have kept infrastructure spending at its 1950–1960 levels during the subsequent two decades would have required America to build more highways and schools than were needed at the time, or to find some unspecified infrastructure program on which to spend massive amounts of money. But voters signaled their feeling about a major increase in spending programs in the 1970s by enacting expenditure limitation provisions in many states, and by voting down infrastructure bond referenda.

[Response from Dr. Schwab follows:]

I certainly agree with Mr. Wolf's argument that we should have expected infrastructure spending to have, at the minimum, leveled off in the 1970's. We did build major parts of the interstate highway system during the 1950's and 60's; it would be very surprising if a second interstate system would have been a worthwhile investment even if the first was. The baby boom ended in the early 1960's and thus the sharp increase in demand for schools was largely over by the end of that decade. Many communities had an excess of school capacity in the 1970's and 80's and thus very sensibly sharply reduced spending on school buildings.

Mr. Wolf's question points to the more general problem of relying on simple rules of thumb such as "always spend 2 percent of national income on infrastructure". The appropriate level of spending is a complex question. The correct answer depends on the quantity and condition of the current stock of public capital, the changing demands for infrastructure generated by a dynamic economy, and the competing needs for scarce resources from the public and private sector. The fact that public investment fell in the 1970's does not prove that we spent too little then, nor does rising spending in the 1980's and early 90's prove that we are spending too much now.

[Response from Mr. Bernstein follows:]

CERF would like to address a portion of your question by emphasizing its support for national programs to revitalize our national infrastructure. As documented in CERF's National Research Agenda, our national infrastructure needs are vital to the nation's economic health, productivity and ability to compete in the international markets.

In assessing the current state of the nation's infrastructure in the context of formulating an appropriate investment strategy, it is important to recognize that our current and future infrastructure requirements include both the need for new facilities and the maintenance/rehabilitation of existing facilities.

In the latter case, it has been well documented that the maintenance of existing facilities has lagged well behind the need to maintain up to date structures which can effectively fulfill today's needs, yet alone those of tomorrow. For example, recent reports indicate that over 25% of the interstate highway system is in poor shape and that 23% of the nation's bridges are structurally deficient, with another 19% functionally obsolete.

Consequently, CERF has advocated increasing the percentage of monies devoted to research and development, and specifically that devoted to activities which will lead to the introduction of innovative technologies and products into practice.

Innovative technologies and products will lead to less expensive options, which in turn will provide increased public benefits for a fixed level of infrastructure spending. This will help ensure that the spending represents a strategic investment, leading to more jobs and new markets.

In that context, CERF is pleased to report that it has recently finalized a cooperative agreement with the Federal HIghway. Administration to develop a national center to promote innovative highway technologies. The center will be called the Highway Innovative Technology Evaluation Center or HITEC. This national clearinghouse for innovative products in the highway field, will be located at the Turner Fairbanks Laboratory in McLean, Virginia. By providing impartial evaluations of new products for which no industry standards exist, it hopes to enhance the incentives for the private sector to invest in highway oriented research and development, and for state and local government agencies to implement innovative products in the highway system.

[Response from Dr. Taylor follows:]

Yes, I believe so! Our spending on infrastructure as a percent of GNP, according to Aschauer, has declined from about 1.7% of GNP between 1961 and 1975, to about 1.0% in 1986–1987. For transportation investment at least, this represents the decline in interstate spending following its completion. Whatever spending decline may have occurred, it is has significantly been reversed. For instance, the Cato Institute, an admittedly conservative organization, estimates that infrastructure spending on 20 important public programs increased 43% during the last four years. We should also keep in mind that ISTEA funding, even with the obligation ceilings imposed, still represents an increase in spending over recent time periods. For instance at full funding, ISTEA provides $119.5 billion over five years for highways, compared to $73.1 billion the previous five years, for a 63.0% increase. Even after factoring out the approximately 17% underfunding of ISTEA in total ($20.6 authorized vs. $17.7 billion appropriated), spending is still way up.

The additional spending being proposed by the Clinton Administration is nice but not essential. Especially given that some of it is earmarked for extremely dubious projects such as magnetic levitation trains (approximately $650 million). You should also keep in mind that this money is likely to be used to replace funding already committed for projects planned to begin this year anyway. That will be the response to a requirement that the money be spent this summer. So in essence there will be little "new" spending and these funds will really be spent 2–5 years down the road.

A lack of public infrastructure investment has not been proven to be a cause of reduced growth in productivity. The Aschauer claims about this are based on his regression of investment levels against productivity growth declines. There are two big problems with his claims. First, the day of our hearing it was announced that U.S. productivity had grown at the strongest rate in 20 years (2.7%), yet he and others have been claiming it hasn't grown because of a lack of investment. Also note that our productivity is 20–30% higher than Europe or Japan's still! Secondly, our productivity measures are terrible. They could easily be off by 30–40%. No one should use such data to make policy decisions.

[Response from Dr. Ruane follows:]

Beginning in 1956, the United States embarked on a period of substantial investment in its transportation infrastructure through construction of the Interstate Highway System. Initial development of the Interstate system is only now nearing completion. Several factors argue against calling this period one of peak investment and for increasing the allocation of resources to the federal highway program.

First, while the Interstate system was being constructed, a large proportion of available funds were channeled to that endeavor. As a result, other important surface transportation needs received relatively less than they required. Second, the Interstate system itself was designed with an expected life cycle of 20 years. Since much of the system is now more than 30 years old and has been subjected to greater traffic loads than originally projected, there is a significant and growing need to rebuild substantial amounts of the roadway. Third, since initiation of the Interstate program, new centers of population and economic activity have developed and grown. U.S. Census Bureau data show that there are now more than 200 new population centers of 50,000 or more that are not being served by Interstate-standard highways. This deficiency must be corrected if the economic and social benefits of a sound transportation network are to be enjoyed.

Far from needing a cyclical pattern of transportation spending, the United States should adopt a sustained strategy of consistent investment aimed at eliminating the backlog of existing highway needs, now estimated by the U.S. Department of Transportation at $212 billion.

GLOBAL INVESTMENT GAP

Mr. Wolf. Also, there is much talk of an "investment gap" between the U.S. and other industrialized nations. Isn't this also misleading when you consider that infrastructure statistics for foreign countries include many items—such as public utilities—that are in the private sector in the U.S. Also, costs are much higher in some foreign countries such as Japan, where land is much more expensive and road construction is not as efficient as in the U.S.?

[Response from Dr. Penner follows:]

Anyone who has tried to travel from Yokohama to Tokyo or even from Narita airport to Tokyo knows that Japanese infrastructure is in terrible shape. They have to spend enormous amounts of money to catch up with us.

[Response from Dr. Hulten follows:]

Anyone who thinks that the Japanese economic miracle occurred because of superior infrastructure should try riding the Tokyo subway or using the urban road system during rush hour. Commute times in Japan are notoriously long. Japan's success came from other factors, like a high rate of national saving and because Japanese manufacturers pioneered new production techniques, like quality circles and the just-in-time inventory system. It would be more accurate to say that the Japanese miracle occurred despite infrastructure rather than because of it.

Moreover, any attempt to compare the quantity and quality of infrastructure capital across countries is perilous, since the public sector encompasses different functions in different countries. And, the impact of infrastructure investment will depend on the industrial composition of economic activity, which also differs among countries.

[Response from Dr. Schwab follows:]

I also agree with Mr. Wolf's point that international comparisons in infrastructure are difficult. It is true that the private sector provides certain types of capital in this country that are supplied by the public sector in other countries; telecommunications investment is a good example.

More generally, it is difficult to see how we might use the level of spending in other countries as a guide to the appropriate level of spending here. The international evidence on the link between infrastructure and economic performance is weak. I can think of many reasons why Japan has fared better than the U.S. over the last several decades; the Japanese save and invest a far higher share of their income than we do, Japanese children receive what many regard as a much better education, Japanese firms often seem more willing to take a long planning horizon, and so on. But I do not believe that the secret to Japan's success—a country where indoor plumbing is still not the norm and cities often hire people to cram passengers onto subways at rush hour—is public capital.

[Response from Mr. Bernstein follows:]

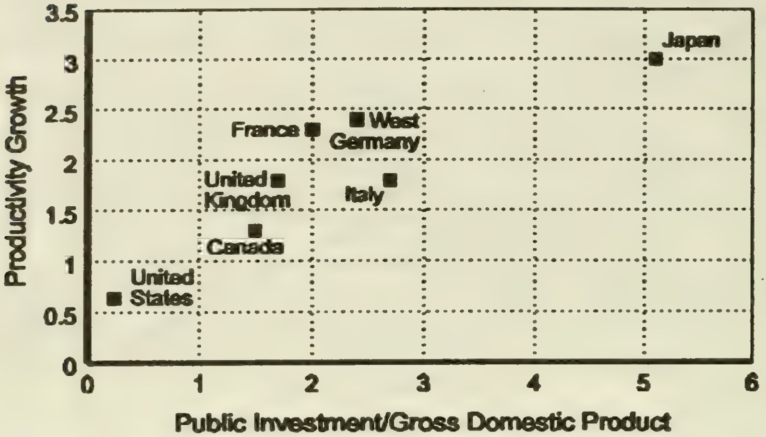
CERF acknowledges the fact that it is difficult to draw country analyses with respect to infrastructure investment for the kinds of reasons which you raise in your question.

Nevertheless, CERF would like to make two points to supplement its testimony before the Subcommittee.

First, CERF has recently completed a project for the Army Corps of Engineers in response to a Congressional directive, which analyzes the Federal role in public infrastructure research and development (R&D). In the final report from that project, "The Federal Public Works Infrastructure R&D: A New Perspective, "CERF notes that" A striking difference between the United States and the other industrialized countries is the significant involvement of industry in construction (infrastructure related) R&D; in the United States investment by industry is low, estimated recently at less than 0.1% of annual construction volume.

Second, in the 1990 report "Public Investment and Private Sector Growth," published by the Economic Policy Institute, the author specifically analyzed the relationship between public non-military investment and growth in gross domestic product per employed person, while specifically controlling for private investment and employment growth. As can be seen in the following chart from that report, there is a clear relationship between economic growth and public investments in a nation's infrastructure.

Cross-Country Comparison of Productivity Growth and Public Investment to GDP Ratio (1973-1985)



Source: Public Investment and Private Sector Growth, published by the Economic Policy Institute (1990)

[Response from Dr. Taylor follows:]

Yes, it is misleading! I would ask, if we have an investment gap in transportation, why is it that those other countries roads and rail systems are far inferior to ours and why is it that they have more congestion than we do? Interestingly, U.S. productivity in the logistics and transportation sector has increased dramatically in the 80's. For instance, logistics costs as a percent of GNP have dropped from 14.7% of GNP in 1981, to 11.0% in 1990. Inventory, as a percent of total sales, has declined dramatically, from 26% in 1981, to 20% in 1990. This is largely due to a more efficient and reliable transportation system that allows us to centralize and reduce inventories, while delivering them reliably and in less time than ever before. Freight transportation expenditures as a percent of GNP have dropped from 8.1% of GNP on average in the 1970's to 6.3% in 1989. Measured another way, the rail freight system increased its productivity by 9.7% in 1992 according to the Labor Department, and the trucking industry's productivity increased by 4.5% in 1992. Something is being done right!

Yes, there are needs, but there is every indication that we have the best transportation system in the world today, despite much greater distances that must be covered. Interestingly, while Europe has a great rail passenger system, they're rail freight system, and their intermodal system are a disaster compared to here.

Overall, our economy has outperformed Germany's all through the 80's, and we are currently posting far stronger growth than Japan. Yet Japan had investment of 5.1% of GNP in the 80's, compared to our 1.0%. Part of the difference is due to the fact that both Japan and Germany include electric generation, telecommunications, and railroad investment in the public sector, while this investment is private in the U.S. There is no way to compare these numbers on a broad scale.

[Response from Dr. Ruane follows:]

Regardless of differences in the allocation of responsibility for components of the national infrastructure, the fact remains that America's transportation system is under-financed. The existence of an infrastructure gap is clearly implicit in the conclusion of the Department of Transportation that an annual capital investment of $51.6 billion for the next 20 years is required just to maintain 1991 conditions on the nation's roads and bridges. This compares to the $36.1 billion we spend today, a 42 percent difference.

LOCAL GOVERNMENT INFRASTRUCTURE PRIORITIES

Mr. Wolf. We are constantly hearing that state and local government can no longer finance local infrastructure absent more federal help. However, the evidence suggests that our worst problems with deteriorating roads and bridges are in states and localities that made conscious decisions to use their bonding authority to address other priorities, such as stadiums and convention centers. Why should taxpayers in states that have managed their resources well and maintained their road networks in good repair now have to help pay to rehabilitate the roads and bridges in states that could also have done so but, instead, pursued other priorities? Doesn't that punish good management, and reward bad?

[Response from Dr. Penner follows:]

States and localities have recently increased their infrastructure spending by very large amounts. As I said in my formal testimony, project evaluations should always ask whether Federal, state and local or private financing is appropriate. It is clear that state and local taxpayers trust their governments somewhat more than they trust the Federal government and are more willing to pay the taxes necessary to finance infrastructure at the state and local level. This willingness is also indicated by recent votes on bond issues.

[Response from Dr. Hulten follows:]

Those who say that state and local government cannot finance local road and bridge construction without federal help should recognize that the federal money comes from the Highway Trust fund, and that most of the money in the trust fund comes from gas tax money raised in the states themselves. Under the minimum allocation rules, most of the money goes back to the state in which it originated, and the federal government is essentially a tax collector. "Federal help" for highways means, in this context, getting money from the pool left over after the minimum allocation, which is to say, from donor states. Or, it means new federal funding sources. This may be appropriate if the recipients use the money for roads of national significance, or need additional funds in situations of temporary fiscal distress (e.g., a period of unexpected jobs losses). The case is dubious when states that have kept their own state gas taxes low argue that "federal help" is needed in order to repair roads and bridges or to alleviate congestion. This doubt is increased when those states managed to spend money on other infrastructure items like sports arenas and stadiums, or on roads and bridges in other parts of the state when their urban highway infrastructure was deteriorating.

[Response from Dr. Schwab follows:]

The question of whether the federal government or state and local governments should fund infrastructure investment is complicated. Some infrastructure projects (such as interstate highways) yield benefits that extend well beyond the boundaries of any single state or community. We cannot expect state and local officials to take into account the benefits that people who live elsewhere receive, and thus in these cases the federal government must play an important role. In other cases, however, benefits are largely concentrated within a community (or perhaps a state). In these cases there is little reason for the federal government to intervene. Thus we might reasonably ask state and local governments to assume the major responsibility for maintaining the condition of local roads and undertaking those transportation projects that mainly serve a single community, metropolitan area, or state.

[Response from Dr. Taylor follows:]

They shouldn't beyond the major commitments already being made. It is also important to keep at least 20% match requirements to make sure the projects are truly needed and have a good return on investment. States can come up with the necessary funds by (1) improving the efficiency of their county and state highway departments (2) bonding (if they have not wasted their bonding authority on stadiums, etc.) (3) raising gas taxes if they desire, (4) allowing for more public-private partnerships as specified in Section 1012 of ISTEA, or (5) borrowing the local match requirements from the federal government during the first two years and paying it back over the next four.

In fact, by having some 100% non-federal projects, states can receive an ISTEA Section 1044 soft match credit for the amount of the non-federal expenditures. States can then use that credit for up to three years to have other planned projects funded 100% federally. There is a requirement that the state's non-federal spending dollars must continue to trend upwards. The Section 1044 soft match credit does not increase a state's federal funds, and in fact uses them up at a faster rate, but allows them to undertake projects with no local match and instead use their soft match credits. So this in part addresses the concerns about local funding being strapped.

[Response from Dr. Ruane follows:]

State and local governments, like all public bodies, must establish priorities for public expenditures that reflect local needs. Most governments suffer from a lack of resources to provide all of the services and facilities asked of them, schools and hospitals as well as roads and streets. Recent evolution of the federal highway program has considerably reduced the possibility of diverting highway funds from states with good records to those with a poorer history of attention to transportation needs. Development of formulas for the allocation of federal highway funds was a major point of debate in writing the Intermodal Surface Transportation Efficiency Act of 1991. The concept of equity now dictates that states receive virtually all of their contributions to the Highway Trust Fund, thus greatly reducing any "subsidy" to other states.

NEED FOR STIMULUS PACKAGE

Mr. Wolf. The *Washington Post* recently editorialized that a promise of a $20 billion stimulus package would "stimulate more political activity than economic activity." With the economic indicators now heading in the right direction, do we need a stimulus package? Isn't deficit reduction the most productive thing we could do right now for the economy?

[Response from Dr. Penner follows:]

I agree that we should concentrate on long-term deficit reduction. There is no need for a stimulus package at this time.

[Response from Dr. Hulten follows:]

Deficit reduction should be the first budget priority of Congress. Additional spending on infrastructure, beyond that money already provided for, detracts from this goal. I remain skeptical that infrastructure spending can be accomplished over the time horizon needed for a short-run stimulus, and question whether such a stimulus is really needed during this phase of the recovery. From a long-run standpoint, I think that dollars spent to achieve credible deficit reduction will ultimately have a larger impact on private productivity than dollars spent on a short-run public works program.

[Response from Mr. Bernstein follows:]

CERF believes that although short-term actions or responses may be needed to stimulate the economy, the Subcommittee's focus should be on actions which will provide a strategic investment in our nation's future. To that end, CERF believes that the most important path to fundamental change is a long-term focus on programs that promise lasting positive impacts.

Consequently, CERF has advocated programs for revitalizing our deteriorating infrastructure, creating a climate which stimulates innovation, and reducing risk and liability associate with introducing new U.S. products and services into the marketplace.

Likewise, CERF would like to note that in examining research and development programs, there are undoubtedly short term, high impact areas which can produce significant research payoffs. Programs such as the Highway Innovative Technology Evaluation Center (HITEC) and other technology transfer programs should reap substantial short- and mid-term benefits. At the same time, it is extremely important that the government does not abandon longer term research. In that regard, it is important to remember that much of the Intelligent Vehicle Highway System (IVHS) work, which is currently viewed as applied research, has grown out of research which actually began some 30 years ago.

[Response from Dr. Taylor follows:]

Yes! The short term "investment" will not be spent this year. It will be spent 2–5 years out according to all eight people who testified at your hearings. Currently planned and funded projects will be funded with these dollars so they can claim they were spent this summer. The net increase in funding will show up in overheating the economy at that time. There are just too many rules and regulations to allow this money to be spent on new projects this year.

[Response from Dr. Ruane follows:]

Regardless of labels, additional expenditures on transportation facilities are needed, whether for immediate job creation or long-term investment. Even in the current period, unemployment in the construction industry remains about double the national average. Contractor capacity utilization in 1992 was below 50 percent. In addition, the highway and bridge needs referred to earlier will remain even in a period of unquestioned recovery and prosperity. The sooner they are addressed, the better the nation will be.

Reducing the federal deficit should indeed be a high priority for Congress and the administration and is part of the stimulus package proposed by the President. This in not a question of either one or the other. The proposals relating to the highway program call only for fully funding the surface transportation program which became law 15 months ago.

Mr. Wolf. If we agree to a $20 billion stimulus package which has to be funded by American taxpayers and businesses either through more government borrowing or a hike in the gas tax, aren't we robbing Peter to pay Paul? Have we stimulated the economy, or have we stimulated additional tax burden for the citizens?

[Response from Dr. Penner follows:]

A stimulus spending package financed by tax increases is a contradiction in terms. There would be no increase in aggregate demand. In any case, $20 billion is lost in the noise of a $6 trillion economy.

[Response from Dr. Taylor follows:]

Yes! Almost every economist will tell you that private investment has a higher return to the economy than public investment. Aschauer's claims that public investment has a higher return than private, and that we should tax to make such investments, have been thoroughly contradicted in the literature. Aschauer claims a .39 coefficient of elasticity for public core infrastructure investment, compared to .26 for private investment, implying we should tax and invest until these coefficients are brought into equilibrium. However, others, such as Hulten and Schwab, who testified before the Committee as well, find the public coefficient to be just .03, far below the return for private investment.

An energy tax of 10% will cost the economy a half point of GDP growth according to estimates prepared last year by Data Resources, Inc. The U.S. has a highly specialized and geographically dispersed manufacturing and distribution system that requires high speed and reliable transportation.

We replace and centralize our inventory in order to improve productivity but must substitute transportation. Firms increasingly use services like Federal Express and UPS, instead of placing inventories or manufacturing in market areas. Increasing energy prices will drive us back to older less efficient manufacturing and distribution systems.

It is also important to note that other countries like Japan and Germany, while having high energy taxes relative to ours, don't have the distances to deal with that we do. It is also important to note that they are not exactly role models. Their overall economies are far less productive than ours, and their standard of living is way below ours—look at Japan and what their per capita income buys them compared to us.

It is also important to note that an energy tax will disproportionately impact states like Michigan that are manufacturing intensive and farming, rural for the most part, located on the outer fringe of the nation geographically, and located in a cold weather climate.

[Response from Dr. Ruane follows:]

The additional funding for the surface transportation component of the stimulus package would require neither additional government borrowing nor an increase in the federal motor fuels tax. That is the virtue of the Highway Trust Fund which, since its establishment in 1956, has provided a steady, reliable source of revenue. The highway program has never contributed one cent to the federal deficit, and this situation would not change under the stimulus proposal. It is true that revenue projections indicate the trust fund's income could be inadequate to fully fund the highway program beginning in 1994 or 1995. This situation can be readily corrected by transferring the 2.5 cents-per-gallon of the federal gas tax now allocated to the General Fund to the Highway Trust Fund.

IMPACT OF INFRASTRUCTURE INVESTMENT ON ECONOMY

Mr. DeLay. The question of additional spending in infrastructure seems to be is it worth it. That is what we are trying to figure out here today.

In examining the effects of spending on productivity, can you describe the link between the two?

How does your description of the effects of public spending, whether it be for mass transit or roads, differ with those that believe federal expenditures are necessary and vital to the growth and strength of our economy?

Given the current economic indicators, what if we, meaning Congress, were to do nothing at all? What if we did not spend another nickel on infrastructure other than what we normally appropriate each year?

Could there be any benefits in actually doing nothing?

[Response from Dr. Hulten follows:]

A modern economy cannot function without an adequate stock of roads and airports, electricity generating and telecommunications facilities, or without water and sewer systems. Infrastructure investment is clearly a necessary ingredient of private productivity growth. There are times in a nation's history when it is the key ingredient, as when a transportation network is used to open up an under-developed part of the country—the intercontinental railroads in the U.S., for example—or when the country has outgrown its existing infrastructure networks, or when new technologies make existing networks obsolete. In these situations, a major commitment to infrastructure spending may be needed to set the stage for further growth.

However, there are also times when further spending has little aggregate impact. Adding capacity to an already build-up system, by widening a road or example, may produce only modest gains, and may just have the effect of relocating economic activity from one place to another. Indeed, states and communities may expand their infrastructure in an attempt to attract new businesses from elsewhere in the country, and this may result in over-building and under-utilized capacity in many places.

My reading of the macroeconomic evidence on the relation between infrastructure and economic growth persuades me that many of our traditional infrastructure systems fit into this second scenario. This view is buttressed by the widely quoted 1988 study by CBO that found a high rate of return to spending on maintenance and a very low rate of return to new construction, except in congested areas. This suggests to me that a dramatic increase in new infrastructure spending programs—above and beyond the money already provided for in ISTEA-91—will not produce an "Economic Millennium." It also suggests that our primary effort in the infrastructure area should concentrate on using existing facilities more efficiently, and by adding capacity only where there is a compelling need.

This is where I and my colleague Robert Schwab seem to differ from those think that we had a massive under-investment in our infrastructure systems during the 1970s and 1980s, and who argue that a major new commitment in the infrastructure area will have a huge effect of U.S. economic growth. We have found no such massive pro-growth effects in our research and, as we noted in our testimony, the evidence which is offered in support of the under-investment position is too problematic to use as a basis for spending billions of additional dollars on new infrastructure programs.

Doing "nothing more" than we are currently doing is still doing quite a lot in the highway area. ISTEA-91 provides for a significant increase in funding for America's highway system over previous spending levels. Spending more than this runs the risk of putting money into lower productivity projects, and of invoking the old specter of "pork barrel" public works projects.

[Response from Dr. Schwab follows:]

Some infrastructure investments, especially when past investment has been very low, can have a dramatic impact on productivity. Thus, for example, a major highway in a developing country that has a very poor road network or new electrical generating capacity in a developing country where energy sources are limited and undependable can lead to major increases in productivity. But the U.S. has a mature capital stock and most of the opportunities for investments which would offer dramatic productivity increases have been exhausted. In this setting the link between infrastructure investment and productivity is weak.

There have been many cases in the social and physical sciences where the initial research on a problem has provided some provocative results that are not validated by subsequent research; the excitement over cold fusion several years ago is a good example. In many ways, this is precisely what happened in the debate over the link between infrastructure and economic performance. David Aschauer's research, which first appeared in the late 1980's, suggested that this link was very powerful. Aschauer's results led to a significant body of research on this question including papers by Hulten and Schwab, Holtz-Eakin, Eisner, Karras and Evans, and others. This subsequent research has found little support for Aschauer's hypothesis; my reading of the later evidence is that additional spending on public capital would have no discernible effect on the economy.

[Response from Mr. Bernstein follows:]

In considering the relationship between infrastructure spending and productivity, CERF would like to emphasize the need to increase the percentage of monies devoted to research and development, and specifically that devoted to activities which will lead to the introduction of innovative technologies and products into practice.

Innovative technologies and products will lead to less expensive options, which in turn will provide increased public benefits for a fixed level of infrastructure spending. This will help ensure that the spending represents a strategic investment, leading to more jobs and new markets.

The potential benefits from innovation are clearly documented by two ongoing CERF projects.

For example, CERF is currently working with a research consortium to design, develop and test innovative designs for steel reinforcing bars or rebars, which are widely used in the construction industry. In fact, approximately five million tons of steel are used each year for rebars.

Based on preliminary results from this project, CERF estimates that new innovative rebar designs can be developed which will produce cost savings exceeding $100 million per year.

In another project, CERF is examining the application of innovative technologies associated with computer aided design (CAD), computer aided engineering (CAE) and real-time position measurement (RtPM) in the construction industries. The potential impact of these technologies are substantial. On a life cycle basis, when this technology is widely adopted, CERF estimates that the annual savings for industry will be in the billions of dollars.

[Response from Dr. Taylor follows:]

My own view is that a) public infrastructure investment has a weak and positive link with productivity. b) My view is that such expenditures have an opportunity cost in higher taxes and that present spending levels are sufficient. c) If we did nothing we would still have higher spending levels as appropriated than in the past five years. d) The benefit to doing nothing is that we won't inject a bunch of money that won't in fact get spent for 2-3 years right when we least need it. Trying to spend the money quickly will just drive up bid prices. The kinds of projects we spend the money on quickly will also be those that have the lowest productivity and competitiveness benefits. Basically, simple resurfacing projects.

Mr. DeLay. The cost of regulation in our nation stifles American productivity. As I suggested in my opening statement, there are some 30 government regulations which reduce competition and inflate construction costs by as much as 50 percent.

Are there any specific government regulations that stand out in your mind as burdensome and costly to American productivity?

What immediate effects would the repeal of Davis-Bacon regulations have on the infrastructure spending of this nation?

[Response from Dr. Penner follows:]

The regulatory problem is very severe. In general, much more careful cost-benefit analysis should be done on regulations. Of course, Davis-Bacon has long existed as a cost enhancer, but now, as you note, construction can be held up by an extraordinary array of regulations. In the environmental area, we have to be more sensible in trying to differentiate between toxic concentrations that are truly dangerous and trace amounts that literally could not hurt a fly. I have head of projects being delayed significantly by silly instances of the latter.

[Response from Mr. Bernstein follows:]

There is no question that government regulations and/or practices at all levels, contribute substantially to the current roadblocks and constraints to introducing new technologies. For example if company A is ready to market a new innovative product in the highway field, it might easily be expected to have to fund technical evaluations for several if not dozens of government entities. And a favorable evaluation from one government agency is no guarantee that another agency will accept the results of that evaluation. In fact, a favorable evaluation from one source might actually decrease the likelihood that the company could get its product accepted in certain other locations.

Consequently, CERF's approach in organizing the new Highway Innovative Technology Evaluation Center (HITEC) will be based on a "consensus based approach" designed to minimize many of the current regulatory and administrative constraints.

Another major constraint is caused by the fear of tort liability. The fact is, that it can be risky to try something new, however beneficial the innovation might be to industry or to society as a whole. According to a 1992 article in Forbes magazine, tort liability claims cost the country $117 billion in 1987, with indirect cost claims at least as high as the direct costs. Estimates put the 1992 cost at well over $300 billion. According to Forbes, "the tort system's direct costs impose a burden in the U.S. five times that in the U.K. and almost seven times the level in Japan."

Imagine the benefits to the U.S. if this money had been used for research and invested in revitalizing our nation's infrastructure system.

[Response from Dr. Taylor follows:]

Yes, there are a number of such regulations. My statement speaks to some of them per attached. a) But more importantly, it is important to note that our biggest transportation productivity returns have come not from infrastructure improvements but from institutional reforms. Interstate economic deregulation of trucking, rail and air services has allowed manufacturers to bring inventory as a percent of GNP down by two full percentage points. It has also resulted in freight transportation costs as a percent of GNP dropping from 8.1% in the 1970's to 6.3% in 1989. However, the states continue to maintain a set of intrastate economic regulations that result in many trucks running around empty because of authority restrictions by geography and by commodity. Texas and Michigan are two of the worst states. In Michigan changing these regulations would save manufacturers an estimated $86 million per year in freight bills alone, not to mention additional logistics savings. The regulations also prohibit trip leasing meaning brokers cannot be used to assure trucks are running full as much as possible. In addition to reducing productivity, these regulations mean more truck miles than necessary are driven, more accidents occur, more fuel is wasted, and more pollution occurs.

The Congress should move to preempt these regulations whenever there is even a slight case that the carrier involved is operating in interstate commerce. This would have a higher productivity return than any possible expenditure levels on infrastructure.

Repeal of Davis-Bacon would dramatically increase the amount of highway and mass transit constructed for the dollar.

[Response from Dr. Ruane follows:]

First, most of government regulation creates a tremendous amount of paperwork for businesses. Reducing the paperwork requirements would help to reduce costs associated with operating businesses. In the case of highway contracting, for a contractor to make a profit he/she must pass paperwork costs along as part of its bid, thereby passing the costs of the taxpayer through increased project costs. This is why ARTBA fully supports passage of the Paperwork Reduction Act.

Wetlands regulation, the Davis-Bacon Act, hours-of-service requirements under the federal motor carrier safety standards, and OSHA's Hazard Communication Standard, are just a few of the federal regulations that are burdensome and costly to the transportation construction industry.

The timing of enforcement is also a burden. For example, the wetlands permitting process is done sequentially rather than concurrently. A concurrent review process by each agency (FHWA, COE, EPA, FWS) would save significant time and money. The following letter to the FHWA more clearly identifies the problems in this area.

According to a 1983 GAO report, the David-Bacon Act increases the cost of federal construction projects by an average of 5–15 percent. If the ISTEA is fully funded, repeal of the Davis-Bacon Act would provide at a minimum an additional $1 billion a year for transportation construction projects. This money that is currently spent out of the highway trust fund for federal and federal-aid transportation projects, to meet the requirements of the Davis-Bacon Act.

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ARTBA
American Road & Transportation Builders Association

March 2, 1992

Federal Highway Administration
Docket Room
Docket 92-12
400 Seventh Street, S.W.
Room 4232
Washington, D.C. 20590

To the Docket:

President Bush has asked all federal departments and agencies to "weed out unnecessary and burdensome government relations which impose needless costs on consumers and substantially impede economic growth." In pursuit of this goal, the U.S Department of Transportation has sought public comment and suggestions.

The American Road & Transportation Builders Association (ARTBA) applauds the President's initiative and welcomes this opportunity. Our organization represents nearly 4,000 companies and public agencies involved in transportation construction in the United States.

Our comments address three specific problem areas for our industry: (1) Federal handling of Environmental Impact Statements and the 404 Permitting Process; (2) the ongoing Federal Wetlands Policy Review Process; and (3) Pending storm water runoff regulations.

Our comments are as follows:

(1) Federal Handling of Environmental Impact Statements & the 404 Permitting Process

Federal agency involvement in the implementation of two federal laws, the National Environmental Policy Act (NEPA) and the Clean Water Act, dramatically impacts the start-up of new transportation construction projects throughout the United States. A lack of cooperation between agencies often results in unnecessary delays that increase the ultimate cost to the taxpayer and cause management problems for state and local transportation agencies and contractors.

Section 404 of the Clean Water Act requires project owners to obtain a permit from the federal government prior to initiating work that might impact a wetlands area.

The NEPA requires state and local transportation departments and/or property developers to prepare a detailed environmental impact statement (EIS) for transportation construction projects that are contemplated. The EIS must be approved by the U.S. Department of Transportation, with the concurrence of other relevant federal agencies (eg. Environmental Protection Agency, the Department of the Interior, the U.S. Corps of Engineers, etc.) before final DOT approval of the project.

Coincidentally, Section 404 of the Clean Water Act, requires project owners to obtain a federal permit before construction can commence on a project that may impact a wetlands area. The EIS is needed to obtain the permit.

NEPA requires federal agencies to "cooperate" during the EIS process, provide guidance and specific comments about concerns falling under their jurisdiction. The Corps is charged with ensuring that the EIS can be used during the 404 permitting process.

What often happens is that some agencies involved do not fully scrutinize projects during the EIS stage. They then often attempt to change projects during the 404 permitting process -- in essence requiring the project owner to start the planning process all over again.

Three actions are necessary to improve this situation:

(a) True cooperation is needed between FHWA, FAA, EPA, the Corps and the other federal agencies involved throughout the EIS and 404 permitting process. The goal of every agency involved should be to expedite needed transportation improvements not to delay or circumvent them. Project owners need to be told up front what they can do to mitigate possible environmental concerns.

(b) Federal agencies involved in the EIS and 404 permit process must allocate additional resources and manpower to move the approval process forward more quickly. A reasonable time-frame for approvals should be established and adhered to. Parties seeking approvals should know at the outset how long it will take to receive a decision on a project.

(c) Agencies involved in the EIS and 404 permit process should initiate their work on an individual project concurrently. We are told, for example, that EPA habitually waits until the Corps has acted on a project before it begins its ARTBA review, and then the agency often uses its veto power to reject a permit.

(2) Federal Wetlands Review

The review process is currently underway to revise the *Federal Manual for Identifying and Delineating Jurisdictional Wetland* should be expedited. We believe that the final revisions should require that independent evidence for each criteria -- hydrology, vegetation and soils -- be provided before a site may be classified as a wetland. The manual must also be written so that the involvement of specific federal agencies in wetlands delineation is clearly defined.

(3) Storm Water Runoff

The Clean Water Act requires that a environmental government agency at either the federal or state level must grant a storm water runoff permit before work can commence on a federal-aid highway project. It has yet to be determined by regulation who should obtain the permit -- the contractor or the state/local transportation agency. ARTBA recommends that the appropriate permittee should be the state highway agency since they have developed the project, know the runoff problems and have experience in obtaining permits such as this.

Again, ARTBA appreciates this opportunity and stands ready to provide additional comments on these issues and others as the process continues.

Sincerely,

T Peter Ruane

T. Peter Ruane
President & CEO

USER FEES AS AN ALTERNATIVE

Mr. DeLay. I am very interested in the use of existing infrastructure more efficiently.

As an alternative to infrastructure spending, what effect would varying airport landing fees by time of day have on air traffic and what benefits could be realized? (I understand that shifting some traffic to off peak hours could provide a benefit of $3.8 billion annually.)

What study has gone into the idea of replacing current highway taxes with fees based on vehicle weight per axle and distance driven?

[Response from Dr. Hulten follows:]

In general, we should try to use user fees as much as possible and use them to combat congestion where feasible. In the extreme, I see no reason why airports and certain other facilities should not be privately operated on a for profit basis. If there are certain activities that governments would like to subsidize that could be done very explicitly. Of course, one must be sensitive to the inconvenience created by various collection devices and by the cost of collection more generally. There are, however, various electronic collection devices now available that make congestion fees very practical.

[Response from Dr. Schwab follows:]

I believe that the best way to get the most from our infrastructure dollars at this point in time is to concentrate on improving the efficiency of the existing systems. This means a more sensible price system for many users, congestion pricing and better design of our grant system to increase the accountability of private contractors and state and local governments. A good start was made by ISTEA–91, and this start should be reinforced by subsequent legislation. One idea, in this regard, is to require follow-up studies of specific projects to see benefits and costs they actually produced. Such follow-up studies could be very useful in identify criteria and "filters" that could be used by Congress to set future spending priorities and evaluate specific requests for infrastructure funding.

[Response from Dr. Hulten follows:]

Clifford Winston of the Brookings Institution has done a great deal of well respected research on a wide range of infrastructure policy questions including tying highway taxes to vehicle weight per axle, tolls, and traffic signal coordination. His book with Kenneth Small and Carol Evans *Road Work: A New Highway Pricing and Investment Policy* and his recent article "Efficient Infrastructure Policy" in the "Journal of Economic Perspectives" are very good sources on these issues.

[Response from Dr. Taylor follows:]

Varying landing fees can reduce congestion certainly. The same applies in terms of bridge and highway tolls. but there is a downside. Shippers and carriers are using facilities at the most efficient and productive time for them. Forcing use at a different time reduces their efficiency. This is especially true when you think about courier services and just-in-time shipments in the trucking mode. For instance, auto parts moving to the assembly line every four hours around the clock, rely on a low cost system day and night.

The idea of weight and use taxes has been extensively studied. Some states are moving in this direction. However, there is some question about how much damage is really done by heavy trucks, especially when the weight is spread over more axles as is the case in Michigan where we allow up to 167,000 pound trucks.

TOLLS ROADS

Mr. DeLay. I have long argued for a required cost-benefit analysis with regards to public transit systems. Privatization of transit has proved to be much more effective than public transit in many parts of the country.

What immediate benefits could be realized with the introduction of more toll roads?

What percentage of roads could be converted to toll roads easily?

What roads yet to be constructed could possibly be constructed as toll roads?

[Response from Dr. Taylor follows:]

Toll roads would get us more infrastructure whether publicly or privately owned. It is also interesting to note that new automated vehicle identification systems allow for most tolls to be paid monthly after billing, reducing the congestion caused by toll collection. It is, however, not entirely clear that private roads and bridges are more efficiently built and operated. Such projects result in large liability exposures for the builder/operator and the methods of transferring this risk to the state are complicated. It is also interesting to note that a market does not exist once the facility is built and that it is difficult to assure proper maintenance and customer service levels. Also, our current roadbuilding system already incorporates a lot of private design, private construction, and in some cases private operation. One of the biggest problems is that private builders cannot get tax exempt financing given the Tax Act of 1986. Also, FHWA is sending conflicting signals on interpretation of Section 1012 which governs public-private partnerships involving federal funds.

I don't know what percent could be converted to public toll roads, or to private toll facilities. In the past, FHWA has prohibited connection of private facilities to publicly funded ones, although ISTEA 1012 should eliminate this problem. Also, facilities constructed with federal funds could not include tolls except for maintenance approved under Section 129(a). However, again, ISTEA should now allow this.

The problem is that FHWA is making conflicting statements. The Policy Office staff say things are allowed but then contracting personnel say things can't be done. Michigan has received such conflicting advice. I could share some memos with you if you wanted.

Bridges are more easily built privately with tolls. Here in Michigan we are looking at construction of a $40 million public or private toll bridge between Canada and the U.S. because traffic has doubled in the last few years. This is an excellent candidate. However, a publicly owned and bonded facility looks more attractive because it can be done tax exempt.

Interestingly, the highest volume U.S.-Canada border crossing for trucks, the Ambassador Bridge at Detroit, was built privately and continues to operate privately. This bridge carries 8 million vehicles a year and would have a $300 million or so replacement cost.

I believe all of the needed border crossing infrastructure on the Texas-Mexico border presents an excellent opportunity for private facilities.

GUARANTEE REQUIREMENT

Mr. DeLay. The simple issue of requiring builder to guarantee their work could save the government millions. Europeans already require contractors to guarantee their work.

What savings could be realized in the future if we were to institute a system of guarantees?

Would this guarantee system have any detrimental effect on the economy?

[Response from Dr. Hulten follows]

I believe that the best way to get the most from our infrastructure dollars at this point in time is to concentrate on improving the efficiency of the existing systems. This means a more sensible price system for many users, congestion pricing and better design of our grant system to increase the accountability of private contractors and state and local governments. A good start was made by ISTEA, and this start should be reinforced by subsequent legislation. One idea, in this regard, is to require follow-up studies of specific projects to see benefits and costs they actually produced. Such follow-up studies could be very useful in identify criteria and "filters" that could be used by Congress to set future spending priorities and evaluate specific requests for infrastructure funding.

[Response from Mr. Bernstein follows:]

Innovative contracting and procurement methods, such as guarantees, hold tremendous potential for improving productivity, cost savings and introducing more innovative technologies into our infrastructure system. However, the application of these methods involves rather complex issues which unfortunately have not yet been adequately evaluated in this country.

In 1988, a Transportation Research Board (TRB) Task Force examined the various contracting and procurement methods used in U.S. and foreign countries. In response to recommendations from that task, the FHWA initiated Special Experimental Project 14 (SEP 14) to evaluate those innovative contracting practices proposed by the states. The main focus of the FHWA were those practices that promote the potential for reducing facility life cycle costs while enhancing the environment for introducing innovations in the highway sector. The techniques that have been identified follow two tracks, a) project delivery systems, and b) contracting procedures.

Promising examples of project delivery systems include: low bid, design/build, turn-key, construction management, and lane rental; and promising examples of contracting procedures are warranties and guarantees, cost-plus-time bidding, and quality and performance requalification.

CERF hopes that these innovative contracting methods continue to be applied and evaluated so that the potential benefits of the specific alternatives can be documented. Also, due to the importance which CERF places in this area, it is currently contemplating initiating a research project to analyze various innovative contracting and procurement alternatives. At a minimum, CERF plans on monitoring activity in this area and cooperating with other groups working on this issue.

[Response from Dr. Ruane follows:]

Instituting a system of guarantees would not provide any savings to the Federal government. Requiring guarantees would substantially increase the costs of transportation projects, because of added up-front costs in design, materials and construction. One of the largest costs would be liability insurance for designers and bonding insurance for contractors. The insurance and bonding communities believe that the insurance and bonds would not even be available if guarantees are required as part of transportation construction projects.

Requiring guarantees implies that quality is lacking in today's highway and bridge system. Our transportation system is built with the highest quality that is not matched in any part of the world. The difference in our highway system versus those in Europe, is that they build with durability in mind. They design and construct their highways to last 40 years, while we design and construct to last 20–25 years. Increasing durability substantially increases the cost of projects, because of increased pavement thicknesses, and improved materials. Currently, it is the state's sole responsibility to specify the design, pavement thickness, and the materials to be used. They provide all the ingredients for the recipe. The design consultant designs the project based on the recipe, while the contractor is the baker who puts the final project together. A contractor has little control or influence over design and materials and plays no role in the maintenance and law enforcement aspects of road use. These realities alone make guarantees unrealistic.

We fully support building and rebuilding our transportation system to the durability standards in Europe.

As previously stated, a guarantee system would have a detrimental effect on the economy, because instituting the system would dramatically increase the costs to build highways and bridges without increasing quality or durability. Because of the lack of available insurance and bonding for designers and contractors, projects would not be built. If we deter our ability to repair and reconstruct our system, American business productivity and efficiency will continue to decline because of our poor transportation infrastructure.

[The statement of Douglas Holtz-Eakin follows:]

Guidelines for Infrastructue Policy

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and

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Prepared for:

U.S. House of Representatives
Committee on Appropriations
Subcommittee on Transportation

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I. INTRODUCTION

There is renewed interest in Federal programs to increase spending on infrastructure in the United States; these hearings bear witness to these events. As is often the case in public policy, however, this interest may not be traced to a single source. Rather support for enhanced Federal budget allocations toward infrastructure draws together a variety of arguments. My purpose in this essay is to reflect on three of the most prominent postulates:

i) that infrastructure investment will generate large, permanent gains in productivity and competitiveness,

ii) that we face a national infrastructure crisis characterized by uniformly decaying and congested infrastructure facilities, and

iii) that infrastructure spending is the ideal tool by which to provide short-run stimulus to the economy.

Before beginning, however, it is useful to summarize briefly the conventional standards by which policies toward infrastructure are evaluated.[1]

Infrastructure provision involves three interrelated issues: what projects should the government undertake, should the Federal, state, or local governments have responsibility for projects, and how should projects be financed? It is now broadly recognized that private, competitive markets are not well-suited to providing certain goods and services, and that the government may potentially intervene in a manner that improves the overall functioning of the economy. A leading example of this phenomenon is the provision of what economists refer to as "public goods," and many infrastructure projects have public goods features. Public goods are identified by the degree to which it is possible to exclude some individuals from using the good and the degree to which they provide shared consumption benefits. For example, it is infeasible to exclude a household in the flood plain from the benefits of a flood control dam once it is provided. Accordingly, each resident or firm has an incentive to let others pay for such a project, while still enjoying the benefits. This makes it unlikely that a private firm could survive by providing flood control services. The use of taxes to finance the project can circumvent the inability to collect revenues privately.

In this example, the benefits are shared across all the protected households, and adding a new household does not subtract from the flood control benefits received by others. Thus, in contrast to the purchase of most items, it does not makes sense to charge any single household for the full cost of providing the service; i.e. flood control. Instead, the project (dam) is desirable if the sum of the benefits to all individuals exceed the costs; a decision that requires collective action of the type provided by governments.

Together, these features suggest general principles for evaluating infrastructure projects. A project is desirable if the collective benefits exceed the costs of the project. Measuring benefits appropriately can be very difficult. Infrastructure investments are long-lived, so benefits in both the present and future must be counted. Infrastructure projects affect the population as a whole, so benefits received by many individuals and firms must be calculated and added up on a consistent basis. The list of pitfalls in these calculations is quite long. However, because no individual, household, or firm has an incentive to accurate reflect the net impact of a project, there is no substitute for carefully done benefit-cost analysis of each project.

Next, projects should be provided at the level of government closest to the affected population. The vast majority of benefits from infrastructure projects such as water supply, sewers, and so forth accrue to local residents. Thus, local governments are best positioned to provide such projects. Only in the case of benefits to larger populations, for example with large highways, should higher levels of government take the lead role.

How should projects be financed? Following the rule for selecting projects, if each household or firm is charged according to the benefits received, the aggregate revenues will cover the costs of providing the project. This provides a general guideline: wherever possible taxes and fees should be set equal to benefits received, with only residual costs financed by general revenues. Combined with reliance on local governments, the logic of these arguments suggests that Federal grant finance should take a residual role wherever possible, and should be used primarily to compensate for the less efficient tax systems at the state and local level.

With these broad principles for evaluating policy options in hand, I turn now to examining recent propositions regarding the role of infrastructure spending in Federal economic policy.

II. THE PRODUCTIVITY EFFECTS OF NEW INFRASTRUCTURE INVESTMENT

Recent interest in the productivity impact of public sector capital stems from the influential work of David Aschauer (Aschauer [1989a, 1989b]), which argues that an important benefit of infrastructure projects is more productive workers and firms. In his, and much of the subsequent research, the center of attention is the relationship between productive inputs -- private capital and labor, public capital -- and economic activity, or output. These studies summarize this relationship with a "production function;" a statistical relationship of the form:

$$q_t = \beta_{0t} + \beta_1 k_t + \beta_2 l_t + \beta_3 g_t + \varepsilon_t \qquad (1)$$

where q_t is the logarithm of private output, k_t is the logarithm of private capital inputs, l_t is the logarithm of labor inputs, g_t is the logarithm of public-sector capital, and ε_t is the residual, unexplained output. The parameters of the production function (β_1, β_2, β_3) measure the contribution of each of the inputs to the productive process. For example, if $\beta_3 = 0$, then investments in public capital have no effect on output or productivity. Further, by entering the variables in logarithms, the β's may be interpreted as elasticities. To give another example, if $\beta_3 = 0.05$, a 10 percent increase in government capital would result in a one-half percent increase in private output. At the heart of the claim that infrastructure spending is the key to faster productivity growth is the notion that β_3 is both positive and large.

In early studies of the productivity effects of public capital, Aschauer [1989a] and Munnell [1990a] examined annual, postwar data for the United States to estimate the parameters of such a production function.[2] The results seemingly argue in favor of infrastructure accumulation as a key determinant of productivity growth. Unfortunately, the nature of the data makes it impossible to place much faith in the estimates. During the 1950s and '60s, the economy fared well and, as a result of programs like the interstate highway system, public capital grew rapidly. In the early 1970s, however, productivity growth slowed dramatically. In the absence of large projects and with the maturation of the baby-boom generation, so did government capital spending. Mechanical application of statistical techniques might tempt one to conclude that there was a *causal* relationship running from slower public-sector capital growth to slower productivity growth. More likely, however, is the reverse scenario. Deteriorating economic conditions tightened government budgets and reduced growth of the public capital stock. The result was similar movements in the two series. Indeed, almost every broad-gauged indicator of economic activity contains this sharp break in the early 1970s, and the underlying causes of the slowdown remain unclear.

Searching for convincing evidence, analysts moved to the "natural laboratories" of the U.S.: the states and their governments.[3] Initially, however, these studies largely produced controversy. On one hand, Munnell [1990b] and Garcia-Mila and McGuire [forthcoming] concluded that differences in the amount of state and local government capital were an important source of differences in states' economic performance. On the other hand, Hulten and Schwab [1978, 1991] found that "residual" state growth -- that not accounted for by growth in firms' capital and labor -- could not be attributed to state-local highways, roads, sewers, and other parts of public capital. Indeed, the residual was at odds with regional patterns of public-sector investment.

In Holtz-Eakin [1992], I argue that the apparent contradiction is easily reconciled. In making comparisons across states, one again runs the risk of reverse causality: successful states have greater resources available for all uses, including government capital outlays. Taken at face value, one might again mistakenly conclude: that greater state and local government capital caused superior economic performance. Thus, statistical techniques used to investigate the productivity effects of infrastructure must be tailored to avoid this pitfall. The approach of Hulten and Schwab [1991] is tantamount to using such a technique. Moreover, direct application of the correct statistical approaches (see below) yields results that suggest no large effect of public sector capital spending programs in boosting productivity growth.

To see the argument clearly, modify equation (1) to keep track of states (s) and permit each state to have a different underlying productive ability (f_s). These differences stem from such natural sources as location, climate, and mineral endowments, as well as such inherited features as the pattern of industrialization. The result is a slightly modified production function that looks like:

$$q_{st} = \beta_{0t} + \beta_1 k_{st} + \beta_2 l_{st} + \beta_3 g_{st} + f_s + \varepsilon_{st} \qquad (2)$$

Consider now Table 1, which is drawn from Holtz-Eakin [1992].[4] Column (1) contains the results of the conventional statistical approach to estimating the β's in equation (1).[5] For purposes of this discussion, the key result is that the estimated β_j is 0.20. Thus, boosting the growth of the public capital stock by 5 percentage points would increase productivity growth by a full percentage point, a seemingly large impact. However, this result is an artifact of using inappropriately simple techniques.

The problem stems from ignoring the f_s : states with a "big" f_s will have more output and greater incomes (directly from (2)). They are also likely to spend more on public programs, leading to a greater g_{st}. (They are also likely to be better places to live and invest, affecting k_{st} and l_{st} at the same time.) What one "sees" is the positive association between g_{st} and q_{st}, which is mistakenly transformed into a prescription for spending on g_{st} in order to raise q_{st}.

The remainder of the columns of the table are devoted to determining how well this result stands up to closer scrutiny by trying different means to circumvent the presence of the f_s in equation (2). Column (2) shows the results of focusing on *changes* in both sides (2) between 1969 and 1986. Notice that by using changes, the f_s are eliminated. That is, changes over time in each state depend only on the growth of inputs and the parameters, and are independent of (unchanging) differences across states. To the extent that public-sector capital is an important determinant of long-run productivity growth, it seems reasonable to expect that it manifest itself over a period of nearly two decades. What is the result? Looking at column (2), the estimate of the impact of public capital (β_3) is now negative. However, because of the large standard error, one is best left with the conclusion that β_3 is essentially zero.

Columns (3) through (6) aim progressively greater extremes of statistical firepower toward the goal of discerning the correct value for β_3. Without belaboring the details, two important conclusions emerge. First, a formal, statistical test strongly supports the presence and importance of the f_s -- states really are different, and these differences complicate the analysis of their economies.[6] Second, and more to the heart of the debate, the single best estimate of the productivity impact of public capital is zero. Indeed, another way to look at the results in this table is that there is only *one* way to get the "big effect" answer. Any other cut at the data suggests that any "smoking gun" in the death of productivity growth does not lie in the hands of infrastructure policy.

It is important to recognize that these results do not imply that the large stock of infrastructure in the United States provides no benefits. Instead, the results say that a broad-based spending program for *additional* infrastructure is unlikely to augment economy-wide productivity growth. This should hardly be surprising. On average, the U.S. has a superb system of highways and roads, modern utilities, and advanced telecommunications systems. The productivity effect of building, say, another interstate highway system could hardly be very great, and certainly not worth the expense.

Further, the very nature of the statistical analyses is to treat all public investments in all locations equally. In this way, they answer the hypothetical question: "What is the effect of randomly dropping another $1 of infrastructure, of any type, anywhere in the economy?" For an infrastructure-starved economy, the answer would be "a lot," but this is hardly the situation in the United States as a whole.

There is an old saying that there are three kinds of lies: lies, damn lies, and statistics. A skeptic might be tempted to relegate the argument thus far to the third category and push forward with a broad-based expenditure program aimed at the U.S. infrastructure. But consider the following upper bound on the growth effects of infrastructure. Suppose that public capital enters on a level playing field with private capital in the aggregate production process ($\beta_3 = \beta_2$), and that labor's share in national income is roughly double that of private capital (roughly in line with the U.S. historic norm). Putting these together implies that

$\beta_1 = 0.50$ and $\beta_2 = \beta_3 = 0.25$. Suppose further that the U.S. devotes an additional $30 billion per year to infrastructure investment, a serious commitment of resources to public capital accumulation. The effect would be to raise the growth of the public capital stock by just under 2 percentage points per year. Using $\beta_3 = 0.25$, GDP growth would be faster by roughly one-quarter of this amount, or in the vicinity of 0.5 percentage points annually. Now, over several decades, a one-half a percentage point increase in growth can make a large difference in living standards. The point is, however, that it takes decades for the effect to cumulate -- there will be no dramatic turnaround in just a year or so -- and that the underpinnings of even this calculation are extraordinarily optimistic.

The logic of this argument is familiar from the debate over the efficacy of private investment incentives: increased investment provides no quick fix for slow growth because it takes enormous amounts of investment to substantially alter the large existing stock of capital. The same truth applies to the public sector as well, so even an unrealistically rosy view of the productivity benefits of public capital does not translate into an instant cure for substandard growth.

It is useful to consider the likely productivity effects of infrastructure from another perspective, that of competing uses for scarce capital. At one level, the argument is simple. If additional infrastructure will have negligible productivity effects, private investment simply *has* to be better. Indeed, public investment is even more costly than it might appear because by transferring $1 of investment from the private sector to the public sector, one gives up a productive private investment for nothing in return. Viewed from this perspective, a case can be made for "budgeting" additional private investment by reducing the Federal deficit and thereby freeing up additional capital for use by private firms, rather than by spending on Federal programs.

Importantly, the "zero effect" discussed above is not the key to this argument. Instead, the guiding rule is that the return on private investment exceed that on public investment. Few studies of infrastructure pose the question in this way, instead focusing only on whether public capital has productivity effects at all. In terms of the production function in (1), the ratio of the productivity effect of public versus private capital is given by:

$$\frac{\textit{Public Capital Output Effect}}{\textit{Private Capital Output Effect}} = \frac{\beta_3}{\beta_2}\left(\frac{\textit{Private Capital}}{\textit{Public Capital}}\right) \qquad (3)$$

In the research discussed earlier, I estimate that the mean ratio of non-residential fixed capital to state-local capital in the states is in the vicinity of 2. This implies that the estimate of β_3 need be at least one-half that of β_2 for the pure productivity effect of public capital to be larger than that of private capital.[7] Notice that even the upward-biased estimate of β_3 just barely makes the grade. Thus, for the data to reveal a need for greater increasing infrastructure, it is not enough to show a positive productivity effect. Instead, the estimated value of β_3 must meet this more stringent test, which is likely for only the most implausibly optimistic estimates.

III. IS THERE A NATIONAL INFRASTRUCTURE CRISIS?

The preceding section argued against funneling significant new budget allocations toward infrastructure on the grounds of putative productivity benefits. As emphasized, however, the aggregate evidence does not mean that there are no capital expenditure projects that would survive a rigorous benefit-cost examination. When identified, however, these infrastructure projects should not be a Federal government policy concern. Provision of infrastructure has traditionally been the province of state and local governments, on the grounds that the benefits largely are restricted to local areas, and that local officials are better able to judge the needs and desires of their constituents. There is growing evidence that these governments react sensibly to the economic environment, both in their employment decisions (see, e.g., Freeman [1987], Holtz-Eakin and Rosen [1991]) and in avoiding irrational swings in their capital spending (Holtz-Eakin and Rosen [forthcoming]). Thus, additional resources will be less likely to be wasted if we adhere to the tradition of reliance on local decision-making.

Of course, if all localities face the same difficulties there are gains to a single, comprehensive Federal policy. The evidence indicates, however, that state needs differ greatly. Table 2 is drawn from Holtz-Eakin [forthcoming]. It shows the ranking of states on the basis of the average annual growth rate of their public capital stock from 1961 to 1974, the value of the growth rate over that period, and the subsequent growth rate between 1975 and 1988. The table drives home the range of diversity in the states' experience. It is true -- as has been widely noted -- that there was a decline in the rate of public capital accumulation between the early and later years in the sample; a decline that the evidence presented above suggests is the result of poorer aggregate economic performance. The tendency to focus on the nation as a whole, however, hides the rather pronounced differences in the rate of capital accumulation across the states, with the highest (Alaska) exceeding the bottom end (California) by a factor of roughly 20. Even more interesting, there is little relationship between growth in the early period and growth in recent years. The notion that all parts of the U.S. have been subject to a uniform decline in infrastructure does not square with the facts.

These hearings are a testimony to the fact that productivity is not the only issue involved in infrastructure policy. We have water supply facilities, sewers, roads, wastewater treatment plants, and other infrastructure in large part because they raise the well-being of our citizens -- not because they make our workers and firms more productive. Thus, one could argue in favor of spending more on infrastructure because of the increase in standards of living that may follow. In this regard, two points are relevant. First, there are many ways to improve living standards, and I see no reason to single out infrastructure for special treatment. At the Federal level, infrastructure spending should compete on a level budgetary basis with deficit reduction, or health care costs, or a myriad of other competing needs.

Moreover, as noted earlier nearly all the benefits of infrastructure accrue to local residents, and an important principle of public finance is to match tax burdens with benefits to generate an efficient and equitable financing scheme. In this case, this logic argues for greater local, not Federal, finance of infrastructure. Table 2 is persuasive evidence that desirable local policies will differ greatly across the United States; reliance on a single national policy towards infrastructure accumulation is unwarranted. Proponents might argue, of course, that a Federal policy need not imply a simplistic, equal-division approach. However, to the extent that the end result of a large Federal program is to allocate some part of the budget to most of the states, it would be tantamount to implementing the hypothetical experiment envisioned above: randomly raining infrastructure funding everywhere in the economy, to little effect. The Federal government could fund additional state-local spending, of course, via grants-in-aid. To lead to an efficient use of the funds, however, the evidence suggests that such a program need necessarily avoid restrictions on the use of Federal dollars. That is, an efficient Federal program must leave room for local officials to either cut local taxes or spend the aid to meet other objectives, and these objectives -- which are sensible from a local perspective -- should not be overridden by the provisions of the program.

One common objection to reliance on local decisions for infrastructure spending is the notion that infrastructure benefits "spill over" from one state or region to its neighbors, thus muddying the clear allocation of responsibilities outlined in the introduction. Operating in isolation, policymakers fail to recognize these extra benefits, leading to underinvestment. The Federal government, the argument continues, is uniquely positioned to solve the problem of uncounted, external benefits by coordinating the investment activities of the sub-Federal governments.

The argument is one part of the textbook tension between the efficiency of a federalist system and the benefits of centralized policies. Unfortunately, when confronted with the data, the textbook argument gets cut short early: there is no evidence of large interstate productivity spillovers. Specifically, in the work discussed earlier (Holtz-Eakin [1992]) I repeated the analysis summarized herein in Table 1, using instead data for eight U.S. regions. In the presence of significant cross-state spillover effects, one would expect that moving from the state level to the regional level would permit one to capture these benefits, thereby resulting in larger effects from public capital.[8] Instead, the estimates are virtually identical to those obtained at the state level, negating the importance of external effects.

IV. INFRASTRUCTURE AND SHORT-TERM ECONOMIC STIMULUS

Most recently, a new argument has been raised in favor of a Federal infrastructure spending program: that it would provide the stimulus needed to recover from the most recent recession. This argument has *nothing* to do with the virtues of infrastructure *per se*. Instead, the benefits of such an approach rely solely on the merits of directly stimulating aggregate demand and employment. It is by now a virtual consensus in the economics profession that fiscal policy is an unwieldy tool for stabilization purposes; monetary policy is generally acknowledged to have advantages in response time and flexibility.

Even among the fiscal alternatives, however, infrastructure is unlikely to be the leading candidate. As noted above, efficient use of infrastructure dollars requires detailed cost-benefit studies at the project level. Thus, the planning requirements of an efficient infrastructure policy are at odds with the timetable of short-run stimulus. To the extent that the demands for quick action dominate, there is pressure to circumvent this type of detailed policy analysis. Moreover, in the end any stimulus effects will fade; the projects are completed and the jobs disappear. Thus, there is no long-run gain to the economy. Worse, if the projects are not carefully chosen we will have squandered valuable capital in exchange for a transitory economic boost.

Finally, one must consider the cost of short-term stimulus via infrastructure spending. From a national perspective, the appropriate cost is the economic activity foregone by spending more on infrastructure. If new spending is financed by taxes -- not by widening the Federal deficit -- firms and individuals must forego the opportunity to spend more on business expansion and consumer goods. As argued above, the first of these has a greater productivity effect than infrastructure, so the net effect is a loss. Also, unless the projects are carefully screened, the consumer benefits are likely to be smaller than their cost as well.

Of course, the same projects could be financed by Federal borrowing. However, this does not change the nature of the costs, it simply defers them to the future -- at some point taxes must be used to pay interest and retire the debt. Some will argue that this line of reasoning is misleading because a slack economy makes it less costly to widen the deficit. In this view, there is an extra benefit not counted above: the stimulus leads to greater employment and capacity utilization. But this very reasoning reveals the flaws in such an argument: infrastructure is supposed to raise productivity growth, and it is widely recognized that adequate national saving is critical to financing faster productivity growth. It is at cross-purposes with the larger goal to widen the deficit and save less as a nation. Critics will argue that we can always provide the stimulus now and deal with the deficit tomorrow. But in the United States, tomorrow has yet to arrive.

V. WHAT SHOULD INFRASTRUCTURE POLICY LOOK LIKE IN THE 1990s?

The impetus for substantial new public capital investment hinges on the perception of an outdated infrastructure that is badly in need of repair and overly-congested. Of course, one might argue that this is exactly what to expect when infrastructure -- or anything else -- is free to use, and when there is no incentive to maintain past investments appropriately. From this perspective, the best infrastructure program does not focus on new spending. Instead, the top priority should be to "get the prices right" by charging user fees for infrastructure services in those circumstances where it is administratively feasible to do so. User fees are consistent with the principal of taxation on the basis of benefits received, would serve to reduce excessive demands on the infrastructure, and would provide a secure flow of funds for purposes of maintenance and modernization.

User fees are not the answer to all infrastructure problems, but are the most promising path in the most high-profile of problems: airports, water supply, port facilities, landfills, waste treatment, bridges, and highways. Technological advances in scanners and sensing mechanisms have eliminated the concern that user fees are impractical and have served to make user fees administratively feasible. It is no longer the case, for example, that charging tolls to control peak congestion automatically backfires by causing endless delays at toll booths. There also has been concern that reliance on user fees would be unnecessarily hard on the poor, but the "fairness" of user fees should be compared to the alternative. Small [1983] points out that highway tolls can make *all* income classes better off, if the revenues are used to lower property taxes, or replace registration and fuel taxes.

Pricing the use of our existing infrastructure efficiently is best viewed as an essential part of any infrastructure spending program. To determine the appropriate size of a project, one must forecast use of the facility, and this is integrally related to the price charged. By revealing the intensity of demand for services provided by public capital, user fees may improve the planning process. Further, when user fees are dedicated to maintenance and modernization, funds will be available for repairs at the appropriate time in the life-cycle of roads, bridges, sewers, and other facilities.

In the past, there has been little or no accounting made for maintenance expenditures, making it impossible to reward timely maintenance, which is typically more cost-effective than new construction. Even worse, for much of the postwar period, Federal policy (via matching grants, especially for highways and water treatment plants) subsidized new investment relative to maintenance. Local governments responded predictably to these perverse incentives with insufficient maintenance and excessive construction plans. While there has been progress on this front in recent years (in, for example, the recent Federal surface transportation bill), a widespread move toward the use of efficient infrastructure prices remains a promising avenue for reform.

VI. SUMMARY

The threads of the argument may now be spun together. First, the statistical foundations cannot support the claim that public capital is the key to faster productivity growth in the United States. At the same time, most of the evidence suggests that private investment spending would have larger beneficial productivity effects than new public capital spending -- including evidence previously believed to favor an infrastructure spending program.

Second, productivity benefits are not the only merits to infrastructure. One must consider as well the impact on the living-standards of individuals. Here again, however, it is important to recognize that there are many ways to improve the well-being of U.S. citizens. There is no compelling reason to single out infrastructure for this role; it should enter budgetary decisions equally with deficit reduction, health care, child care, and a myriad of other competing needs. Moreover, to the extent that there are infrastructure needs in the U.S., they differ greatly across the country. Such needs are best addressed in the traditional fashion by state and local governments, with a reliance on finance at the local level. To the extent that the Federal government provides grants to compensate for inefficient revenue systems, it should not embody wasteful mandates or other restrictions on its use.

Third, regardless of the ultimate desirability of short-term economic stimulus, infrastructure spending programs should not be tailored for this task. The timetable of project analysis will interfere with stabilization goals; short-circuiting this analysis raises the likelihood of permanently underutilizing scarce capital funds in exchange for a transitory economic boost. To finance such a program by borrowing is even less desirable, as it entails reducing further the overall funds available for capital formation.

Finally, the most appealing policies toward infrastructure do not focus on new spending at all. Instead, they should shift the focus toward the efficient use of our existing public capital stock through user fees to control congestion and wear, and incentives for adequate maintenance. Policies innovations in this direction hold the promise of greater return than those focusing on new spending alone.

Table 1[*]

Estimates of State Production Function

Dependent Variable:
Log Private Gross State Product

Variable	(1) OLS	(2) LONG	(3) FIX	(4) GLS	(5) IV	(6) HNR
Log Labor	0.497 (0.0144)	0.643 (0.137)	0.691 (0.0262)	0.659 (0.0225)	0.542 (0.0747)	0.911 (0.0530)
Log Private Capital	0.359 (0.0112)	0.504 (0.142)	0.301 (0.0302)	0.361 (0.0233)	0.472 (0.0653)	0.106 (0.0253)
Log Public Capital	0.203 (0.0190)	-0.115 (0.126)	-0.0517 (0.0267)	0.00770 (0.0235)	-0.0150 (0.0660)	-0.102 (0.0606)
Log Private Capital/Labor	--		--	--	--	--
Log Public Capital/Labor	--		--	--	--	--
Time Effects	Yes	No	Yes	Yes	Yes	Yes
State Effects	No	No	Fixed	Random	No	Differences

[*] For definitions of variables, see Holtz-Eakin [1992]. "OLS" is ordinary least squares, "LONG" is long-differences: 1986 values minus 1969 values, "FIX" is conventional fixed effects estimation, "GLS" is conventional random effects estimation, "IV" is an instrumental variables estimator using other states' data as instruments, and "HNR" is an instrumental variables estimator of a first-differenced equation.

***Significant at 1 percent level.
**Significant at 5 percent level.
*Significant at 10 percent level.

Table 2

Growth Rate of State and Local Government Capital Per Capita
(percent per year)

Rank	State	Annual Growth Rate 1961-74	Annual Growth Rate 1975-88	Rank	State	Annual Growth Rate 1961-74	Annual Growth Rate 1975-88
1	Alaska	9.64	3.14	27	Washington	3.36	0.97
2	District of Columbia	6.89	4.01	28	Utah	3.34	1.87
3	Kentucky	5.88	0.80	29	Connecticut	3.33	-0.22
4	Delaware	5.68	-0.62	30	Louisiana	3.20	0.73
5	Wyoming	5.01	2.28	31	New York	3.13	0.52
6	South Dakota	4.92	1.22	32	New Mexico	3.10	0.91
7	Nebraska	4.81	1.64	33	Illinois	3.03	0.74
8	Mississippi	4.65	0.30	34	North Carolina	3.00	1.08
9	Tennessee	4.63	0.26	35	Pennsylvania	2.96	-0.05
10	West Virginia	4.56	0.93	36	Idaho	2.84	0.54
11	North Dakota	4.47	0.75	37	Arizona	2.78	1.81
12	Montana	4.20	0.59	38	Indiana	2.76	0.29
13	Hawaii	4.08	0.90	39	Rhode Island	2.70	-0.35
14	Alabama	4.04	0.54	40	Ohio	2.57	0.46
15	Maryland	4.00	1.44	41	Michigan	2.43	0.03
16	Arkansas	3.98	0.63	42	Oklahoma	2.32	1.00
17	Virginia	3.92	0.37	43	Nevada	2.18	-0.51
18	South Carolina	3.91	1.30	44	California	2.12	-1.40
19	Texas	3.90	1.20	45	New Jersey	2.08	0.72
20	Missouri	3.80	0.33	46	Massachusetts	2.05	0.63
21	Georgia	3.70	1.60	47	Oregon	2.02	0.09
22	Iowa	3.59	1.15	48	Florida	1.93	1.39
23	Minnesota	3.58	0.80	49	Maine	1.92	-0.14
24	Kansas	3.54	0.86	50	New Hampshire	1.87	-0.57
25	Wisconsin	3.52	0.05	51	Colorado	1.65	1.41
26	Vermont	3.38	-1.18		United States	3.08	0.46

Notes

1. Rosen [1992] contains an excellent exposition of the concepts in this discussion. See, especially, chapters 5, 12, and 21.

2. I also examined productivity effects using this framework. See Holtz-Eakin [1988, 1989].

3. Other studies looked at cross-national comparisons of productivity growth (e.g. Aschauer [1989b]), but the difficulty in finding comparable data and correcting for vast differences in governmental structures has made for rather unstable parameter estimates (see Tanzi [1990]).

4. See the paper and Holtz-Eakin [forthcoming] for a more extensive discussion of the underlying data and statistical techniques.

5. That is, ordinary least squares.

6. The test, due to Hausman and Taylor [1981], compares the parameter estimates from the fixed effects estimator to those from the random effects, or generalized least squares (GLS), estimator.

7. This overstates any preference for public investment because it ignores the distortionary costs of raising revenues to finance public capital outlays.

8. It is also possible for the effects to be smaller as one looks at larger geographic areas. One pitfall of local development strategies is that they may attract businesses and workers largely at the expense of neighboring jurisdictions. The right measure of the effect on overall economic growth is the *difference* in productivity in the two jurisdictions, not just the economic growth experienced in the chosen jurisdiction. There have been many careful studies using regional and municipal data (see, e.g., Duffy-Deno and Eberts [1989] and Eberts [1986, 1990a, 1990b]). One must be careful in interpreting in these studies in order to avoid overstating the impact of public capital at the national level.

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Monday, March 15, 1993.

HIGH-SPEED RAIL TECHNOLOGY

WITNESS

HON. JOHN DINGELL, CHAIRMAN, HOUSE ENERGY AND COMMERCE COMMITTEE, AND A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Opening Remarks

Mr. Carr. This morning the subcommittee will receive testimony on the potential for implementing high-speed rail systems in the United States.

This is a particularly timely hearing since the administration has already announced its support for high-speed rail development. We have heard that the administration's original five-year plan included over $600 million for high-speed rail and an additional $500 million in ISTEA funding for the maglev prototype, for total budget authority of over $1 billion. This number would even be higher if they request funds for Amtrak's on-going programs to raise train speed between Boston and New York.

Of course, these numbers may now be reduced by the administration because of the need to make additional spending cuts. But in any event, it seems likely that high-speed rail will receive higher priority in this administration and therefore require review by Congress and this subcommittee.

High-speed, rail systems, if carefully planned, could provide alternate transportation options for some areas. I believe we should focus our limited resources on low-tech, less risky options and incremental improvements rather than on risky technological showpieces. We need to understand the near-term technology options more fully and that is one of the objectives of this hearing.

On the high-tech end of the spectrum, this Committee has consistently opposed funding for maglev development because we have never seen convincing evidence that this would be cost effective or self-sustaining. Even the business community is not interested in investing in maglev, which should make us pause.

In theory, the Congress could be devoting a lot of resources to the development of high-speed systems, but in all transportation sectors-aviation, highways, maritime, et cetera—we leave it to the private sector to decide which new generation transportation vehicles to develop based on market forecasts. The auto industry is developing electric and natural gas vehicles. The freight industry is developing double stack containers. Boeing is developing the 777 aircraft. It is not clear to me why the Federal Government should in the case of maglev single out and favor one technology over others that may have superior social and transportation benefits.

So I remain skeptical of maglev and I do not expect to discuss it in great detail.

We need to study the economics of medium distance technology to ensure that our federal investment in high-speed rail is used to build transportation systems with certain benefits for high density corridors, and not to satisfy the "field of dreams" ideas of local officials, contractors and land developers. We need to more fully understand the potential economic impact of high-speed rail on our aviation system, which is the envy of the world. We simply do not have enough resources to pursue speculative or ill-planned systems that do not end up making a significant difference in the transportation of passengers or freight.

We are pleased to have with us our good friend and the dean of my delegation, Congressman John Dingell, Chairman of the House Energy and Commerce Committee, which has jurisdiction over rail transportation. We will then have two panels of other witnesses to explore some of these issues in detail.

Chairman Dingell, let me offer you a warm welcome to the subcommittee. Your written statement will be entered into the record.

STATEMENT OF CHAIRMAN DINGELL

Mr. DINGELL. Thank you Mr. Chairman. My comments will be brief. I would like to commend you for holding this hearing. I would like to thank you for the privilege of being here and I would like to tell you how important I view this issue of high-speed rail, in terms of broad national interest.

Parenthetically, I will say that I am not here to discuss advanced technology such as maglev and things of that kind. It is my belief that those are matters that should be looked at with care by the legislative committees so that this committee doesn't have to spend its time worrying about that matter. Maglev is in point of fact a legislative concern and a new technology which may deserve development and incentive. But I am not prepared to tell you that this morning.

I am prepared to say that there is a large opportunity for this country to benefit itself significantly by providing necessary incentives for providing high-speed rail systems using existing rail corridors and to do so at enormous benefit at moderate costs. A national high-speed rail program is long overdue. While the Europeans and Japanese invested heavily to develop high-speed rail systems, we've spent billions for increasingly saturated highways and airports. And oftentimes when the weather turns bad and the airports are shut, air passenger service suffers considerably with significant detriment for the country as a whole.

But pouring more and more concrete has not yielded the intended result. Congestion proliferates; delays and gridlock waste valuable energy and human resources; and our environment suffers as well. We need to invest prudently in our highways and airports, a major part of which can come from dealing with a balanced, coordinated network and developing such a network to reflect today's fiscal priorities and the needs of the country in these areas.

High-speed rail has a lot to offer: energy savings, reduced pollution, safety, land conservation, more efficient use of land infrastructure, and significant reductions in congestion.

There is clear evidence of the value of this in our single high-speed rail line between New York and Washington, D.C. At speeds of up to 125 miles per hour Amtrak carries more passengers on this corridor than any airline and any other carrier and more than covers its operating costs, something which is extremely important. That would not have been possible had we not made sensible, necessary, needed and desirable capital investments in this corridor. Significant funds for capital investments for Amtrak offer us additional benefits of great value.

In testimony before the Senate appropriations a few days ago, the General Accounting Office concluded that the Federal Government must assume a major role in any high-speed rail program. I am pleased that the President has recognized this basic fact and his budget includes investment for high-speed rail. I intend to work with our committee and our subcommittee chairman, Mr. Swift, who is very ably chairing that subcommittee.

Our transportation subcommittee will be holding hearings later this month and we are discussing the scope and nature of the President's program with Secretary Peña. I hope to work with you Mr. Chairman, and this subcommittee to put together and implement such legislation.

Let me outline briefly my thinking. First, the Federal Government must play a major role in any high-speed rail program, including capital funding. This has been proven by the experience of other countries and our experience with the Northeast Corridor. Second, the President's program is modest in terms of type and the numbers of programs that can benefit from the program.

We must target initially Federal dollars to a few deserving projects based on criteria that reflect sound public policies and build on what we have, both physically and legislatively.

I believe that a good investment will result in a good return and that we will see significant benefits from wise expenditures on sensible investments keyed to national need and at the level of the greatest benefit to be returned for the least expenditure. We need to encourage incremental improvements such as eliminating and consolidating grade crossings, improving signal systems, increasing train speeds, eliminating waste, making necessary track improvements, and developing cost-efficient improvements.

At the same time we need to build on existing legislation that promotes high-speed rail. The ISTEA bill created funding for eliminating hazards at rail crossings on high-speed corridors. These provisions set appropriate criteria for targeting limited Federal resources and we should keep them in mind in expanding our high-speed rail program.

This is an issue of great concern in our home State. Secretary Card last year designated the Detroit-Chicago-St. Louis-Milwaukee corridor as one of the five rail corridors eligible for grade crossing funds. The Detroit-Chicago segment is home to 13 million people linking the third and fifth most populous metropolitan areas in the country. This is a 280-mile corridor that has lengthy segments that would easily support train speed of 100 miles per hour.

The State of Michigan, working with Amtrak and Conrail, put its money where its mouth is and its extensive research and investment over the past few years have paid off in both increased ridership and revenues.

Finally Mr. Chairman, I commend you and the committee for acting quickly on the President's 1993 budget request for Amtrak. In the last two Amtrak authorization bills our committee has stressed Amtrak's great need for increased capital funding. The action you have taken will enable Amtrak to make significant and overdue improvements in its aging fleet of equipment, stations and other facilities.

I want to commend you, Mr. Chairman, and I want to urge you to move with vigor on this and I know that you will understand as you go forward that wise investments can reduce expenditures, significantly increase earnings, reduce the deficits of the service and achieve significant benefits for all.

Thank you Mr. Chairman.

Mr. CARR. Thank you Chairman Dingell.

Mr. CARR. Your commitment and expertise in this area is well known and it is a personal privilege for me to have you here today. We are delighted that you made the effort and I am embarrassed that you made it on time.

Mr. DINGELL. I think I had an easier way in.

Mr. CARR. Well, you live further away than I do.

Mr. DINGELL. I would like to tell you that I came on rail, but I didn't. I drove. I will tell you, Mr. Chairman, that I am particularly delighted to be here to congratulate you as you commence your business as Chairman of this subcommittee.

Mr. CARR. We are going to give a lot of thought on a financial basis to the high-speed rail areas and other areas that your committee has legislative jurisdiction over. I look forward to working with you.

Mr. DINGELL. Thank you Mr. Chairman. It is a privilege to be here.

MONDAY, MARCH 15, 1993.

AMTRAK

WITNESS

W. GRAHAM CLAYTOR, JR., PRESIDENT AND CHAIRMAN OF THE BOARD, NATIONAL RAIROAD PASSENGER CORPORATION [AMTRAK]

Mr. CARR. We now welcome to the Subcommittee the first panel, Graham Claytor, President of Amtrak and a person who certainly taught this Member of Congress a lot about rail. Herb Kelleher, President of Southwest Airlines, certainly a stand out in today's aviation environment as an airline that actually makes money. Ed Harper, President and Chief Executive Officer of the American Association of Railroads, also well known to the committee and a person who has benefitted the committee's knowledge over the years greatly.

Gentlemen, your entire statements will be included in the record. I would like you to please proceed with your oral statements and then we will move into questions.

Mr. Claytor, why don't you start?

STATEMENT OF GRAHAM CLAYTOR

Mr. CLAYTOR. I am extremely pleased to be before this subcommittee today to discuss Amtrak's important role in the development of high-speed rail transportation in this country. I should note that I have behind me senior operating and engineering officers who will be able to answer any detailed question. I will try to summarize the major points made in my statement that is to be included in the record.

We at Amtrak very much appreciate the support and assistance of the new Chairman and ranking Members of this subcommittee. The subcommittee has been a joint partner in our effort to develop and improve the Nation's passenger rails and now to move into high-speed operations in multiple corridors around the country. I agree with and support as strongly as I can, the comments of Chairman Dingell and Chairman Carr with respect to this.

I think high-speed rail is the most important project Amtrak has been in the position to undertake since I have been associated with this corporation.

Let me make clear for the record that I think there are two types of high-speed rail that we must look at. Up to 150 miles per hour speeds on existing roadbeds and tracks, I call merely high speed; then over 150 miles per hour and up to as much as 200 to 300 miles per hour requiring a newly constructed dedicated right-of-way for the steel wheel on steel rail system or magnetic levitation, I call ultra-high speed.

Mr. Chairman, I certainly agree with you and Chairman Dingell that while we support the eventual development of both high speed and ultra-high speed, today I will concentrate on high speed, under 150 miles per hour on existing right-of-way. I think we are in the position to go forward with that now. I don't think we are in the position to go forward with the ultra-high speed yet. I think it is for the future.

It may be a great development and we would support it, but today we are going to deal entirely with the high-speed operation on existing rights-of-way at speeds under 150 miles per hour.

At what stage is Amtrak today on this? As Chairman Dingell pointed out, we currently are the only high-speed service in the United States between Washington and New York at 125 miles per hour and our experimental service with the X2000 Swedish train. I think that is the wave of the future that we are about ready to move into. We are constructing the only new high-speed rail operation on what has been largely a conventional passenger and freight Northeast Corridor line between New York and Boston. This will serve not only the entire Northeast Corridor with improved service, but it will serve as a model for high-speed corridors elsewhere in the country and I think it is an important first step towards development of other high-speed corridors outside of the Northeast Corridor.

Amtrak is in the forefront of developing up to 150 miles per hour high-speed train sets for operation on existing roadbeds in this country. The Swedish X2000 tilt train is now being tested and the German ICE train will be tested next summer. But while they are electrically powered, Amtrak is taking the lead in developing high-speed nonelectric power systems for use outside the Northeast Corridor in areas in which we are not yet ready to electrify. This is a very important objective.

We know the principal characteristics we need in these engines, but they push the limits of technology to the point that we have been unable to obtain a satisfactory proposal to build such a locomotive. We will require a minimum top speed of 125 miles per hour with the eventual objective of reaching higher speeds.

We also need the ability to achieve rapid acceleration at higher speeds. Amtrak has accordingly adopted a two-pronged strategy to push industry as quickly as possible to the development of this new locomotive. First, we have strongly endorsed and agreed to payment in a proposal made by New York State to develop operating and maintenance data on the latest generation turbine engine which is called the Turbomeca Makila. This is more powerful than any other turbine engine yet to be developed and two of Amtrak's existing locomotives will be rebuilt with these new engines which we believe will allow two locomotives and three passenger cars to operate at 125 miles per hour.

For Empire Service in New York State these locomotives will be able to use electrified third rail service for operation through the Penn Station tunnels to Long Island at acceptable speeds. This will require changes in the existing dual power facility, but we believe it is feasible.

The second will be 26 new high-speed electric trainsets that will be required for the Northeast Corridor for use on the completion of New England electrification. In the procurement of these train sets Amtrak will consider the feasibility of substituting nonelectric power units with some of these having a dual power, third rail capability. The nonelectric locomotives will be fossil fueled with three phase AC drives or hydraulic transmissions to achieve the higher speeds. They may be diesel or turbine or they must be able to provide extra power for short time periods to reduce travel time on potential high-speed routes.

We have some charts describing these nonelectric locomotives which our engineers will be happy to go over at your pleasure, but I will not include those as part of my opening statement.

Now, with this strategy Amtrak hopes to be able to encourage the industry to push the technological envelope as far and as rapidly as possible in the development of high speed nonelectric power. That really is essential for us to go forward on high-speed corridors out of the Northeast Corridor.

Now, what other steps are needed to move ahead on developing high-speed corridors? While high-speed trains on existing tracks are less costly than building new dedicated roadbeds, I want to make it clear that there are very significant infrastructure costs that must still be faced in addition to the costs of advanced new equipment. While each route to be considered has got to be subject to a serious engineering study to evaluate all the factors that go into this, I think it is quite clear that it's a several hundred million dollar cost to do this for any significant new route. And those costs are in a number of areas that I will mention very briefly.

They include grade crossing eliminations. We must eliminate grade crossings where speeds in excess of 100 miles per hour are to be operated. Experience shows that regardless of the protection with gates, lights, and other such fixtures, a reasonable number of people are foolish enough to run around the gates and run in front of the train. With lower speeds, it is often fatal to the automobile, but generally causes only delay and minor damage to the train. At these faster speeds it will wreck the train and may kill hundreds of passengers. We cannot operate over grade crossings at those speeds and that means if the grade crossing is not eliminated altogether either by being closed or having a bridge, what we have to do is impose a slow order on the trains going through there. If we have very many of those slow orders, the high-speed concept is fairly well wrecked. Grade crossing is an important factor.

There has to be new train control and signal installations including the main element of an automatic train control system which has been developed by the leading freight railroads in this country. This is a safety measure that enables the train to be permanently separated and fixes it so that if an engineer makes a mistake, the system automatically slows the train down. It is an essential factor when you are going to run at these speeds and that is also a very expensive operation.

As a matter of fact, you cannot today operate at over 79 miles per hour by FRA regulation, with which we are in full agreement, unless you have at least cab signals. For the standard high speeds, up to 125 or 150, we don't think that is enough alone. You have got to have an automatic train control system. And that is being installed. We have it mostly on the Northeast Corridor. We are putting such an advanced system in New England right now.

There are also inevitably going to have to be upgrades of track, bridges and interlocking. And in some cases you may have to extend double track. All of that is going to depend on the study of the particular traffic on the particular railroad and the situation as it exists. Where very heavy freight traffic exists, as it does between South Bend and Chicago, if you were going from Detroit to Chicago, the Chicago end would necessarily be on a part of Conrail that has very heavy freight running on it. Either a high-speed rail using that section would have to operate at conventional speeds, or we would have to put in an extra track to run that distance. So that is the kind of thing I want to look at.

What I am trying to make clear is that while taking corridor and making it high speed is feasible and can be done at a fraction of the cost of such things as building a new interstate highway or building a new airport, it's still a very expensive operation and the capital funding has got to come, I think, from multiple sources. It is necessary in some cases, as I say, to build additional track.

Amtrak itself must have a dedicated source of capital. And, for example, I repeat again the one penny of the fuel tax for equipment and some contribution to track and signal improvements as was provided last year in the Swift bill. ISTEA and other bills have to be the source of funding. Grade crossings are a highway problem, not just a railroad problem. And I think ISTEA and other highway funds ought to be relegated for grade crossing changes. For stations and some track and signal improvements, this is such an expensive operation it is hard to look at one source such to do the job. You have got to have multiple sources such as contributions from state and local governments, and they have got to work together.

Then we have a last problem. We must obtain the freight railroad's authority to use their tracks. They are privately owned. While the freight railroads have agreed to work with Amtrak and government agencies to accomplish high-speed passenger service on freight-railroad-owned corridors, it is plain that Amtrak or any other operator must reimburse them and must indemnify the railroad owner against liability from a passenger train accident without regard to fault or degree of negligence involved.

Because of the open-ended potential liability for damages from passenger claims in any accident as well as enormous potential injury assessed punitive damages, and uncompensated freight railroad could not afford to have the high-speed rails operate on its property without some indemnification and Amtrak could not afford to accept such liability without limited relief from passenger damage claims that could run into the $25, $30, $40 million category. I believe this problem can be solved but unless it is, the high-speed rail operations would have to be limited to operation on Amtrak's own tracks or publicly-owned railroads. I don't think that is acceptable. This is a serious problem and we need to address it jointly.

The above are some of the hurdles that we must overcome as we develop multiple high-speed corridors in this country. And I agree that while we have identified six or eight that are obvious candidates, I think we should move one at a time. We cannot do multiple corridors at one time. The first example is the Northeast Corridor from New York-Boston. Next should be a corridor that we start from scratch; a freight railroad owned corridor and then we would probably go on to others. But it is going to depend on funding. It is going to depend on the ability to move forward. But I think we need to move forward incrementally, not across the board. It is not feasible to do that on too broad a basis. We look forward to working with this subcommittee to work this out and overcome the various hurdles successfully and to continue to move toward high-speed rail development.

In conclusion, we applaud the subcommittee and its Chairman for the forward-looking vision and support for the great progress already made in high-speed rail in this country and we are ready to go forward with it. This is the most exciting problem that I have faced in the 11 years I have been with Amtrak and I am proud to say, that we are ready to go.

Thank you.

Mr. CARR. Thank you, Mr. Claytor. Before going to our next witness, Mr. Wolf, do you have an opening statement you would like to make?

Mr. WOLF. No.

Mr. CARR. All right.

[The prepared statement of Mr. Claytor follows:]

TESTIMONY OF

W. GRAHAM CLAYTOR, JR.

PRESIDENT AND CHAIRMAN OF THE BOARD

NATIONAL RAILROAD PASSENGER CORPORATION

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION AND

RELATED AGENCIES APPROPRIATIONS

U.S. HOUSE OF REPRESENTATIVES

MARCH 15, 1993

My name is W. Graham Claytor, Jr. I am President and Chairman of the Board of the National Railroad Passenger Corporation, better known as Amtrak. I am extremely pleased to have the opportunity to appear before the Subcommittee today to discuss Amtrak's important role in the development of high-speed rail transportation in this country.

Let me say at the outset how pleased I am to be working with the new Chairman and the new Ranking Member of the Subcommittee. During my ten years with Amtrak, we have worked extremely hard to developed a close, highly credible and open relationship with Congress, and with this Subcommittee in particular. As a result, we have always viewed this Subcommittee as a joint partner in our effort to develop and improve the nation's rail passenger system, and, indeed, depend greatly on its guidance and direction in fulfilling the goals Congress and the nation have set out for us. I want to assure the new Chairman and Ranking Member that you can expect the very highest standards from Amtrak in our work with you.

High-speed rail development will greatly impact and in many areas define Amtrak's future in the national transportation system. We intend to pursue aggressively opportunities to design, build, operate and maintain new high-speed systems. While our ability to help fund the cost of these systems is strictly limited, our goal is to be the high-speed rail operator of choice in this country.

While I know that the Subcommittee is very knowledgeable about the various categories of high-speed rail transportation, there is still some public confusion and misunderstanding about this. Accordingly, I think it is worthwhile to make clear for the record that there is a substantial difference between what I like to call "high-speed rail," with maximum speeds of 125 to 150 mph, and "ultra high-speed rail" with maximum speeds as high as 200 to 300 mph. Amtrak has already proven the feasibility in this country of providing "high-speed rail" service on existing tracks and roadbeds, built and used for many years for conventional-speed freight and passenger service. The "ultra high-speed" service, however, requires construction of a new and dedicated track system. This may involve the steel-wheel-on-steel-rail system such as those used by the French TGV and Japanese bullet trains, or it may involve the very different magnetic levitation systems that have been tested in both Germany and Japan.

At the outset, let's take a brief look at where Amtrak is today. This is the starting point from which to move into both high-speed and ultra high-speed operations:

- On the Northeast Corridor between Washington and New York, Amtrak's Metroliner Service is the only high-speed rail passenger service operating in the western hemisphere. Daily, our trains travel the fastest and highest density rail corridor in the country at a top speed of 125 mph, with high reliability and growing marketability.
- Amtrak is the only company in the nation actively involved in designing and converting an existing passenger and freight rail line to a high-speed electrified operation. The Northeast High-Speed Rail

Improvement Project will dramatically improve transportation in the Northeast by reducing travel time between New York and Boston. Amtrak has been charged with implementing and managing this important project. The project likely will establish the model for upgrading other rail corridors around the country to permit high-speed rail service.

- Amtrak is at the forefront of developing the nation's first modern high-speed rail equipment, using European developed technology but American construction and safety standards. Following the current operational and market testing of the Swedish X2000 tilt train and the planned testing of the German ICE train this summer, Amtrak expects to procure 26 new high-speed electrically-powered trainsets for use on the Northeast Corridor. This new generation train -- capable of a maximum 150 mph operation and with significantly improved passenger accommodations and ridership quality -- will be manufactured in the United States and meet this country's strict safety standards. Importantly, Amtrak also plans to design and test a non-electric power system for the new trainsets that will permit their use off-Corridor at initial speeds of up to 125 mph, with the hope that even higher speeds can eventually be achieved. Thus, Amtrak will be developing a standardized family of high-speed rail equipment that can be used nationwide over electric and non-electric rail lines.
- Finally, Amtrak already provides conventional speed passenger service over most of the potential high-speed rail corridors in the nation, including all of the five corridors recently identified by the Department of Transportation. As a result, Amtrak is the logical operator of high-speed service over these lines and may well be the most logical entity to oversee any high-speed rail improvements on those lines.

Amtrak's interest in fast passenger service extends well beyond the 150 mph threshold of what we call "high-speed" rail service to the operation of new "ultra high-speed" -- 150-300 mph -- systems. The two most promising candidates for ultra high-speed rail are the proposed TGV steel-wheel system between Houston, Dallas and San Antonio and the 15-mile magnetic levitation system planned at the Orlando International Airport in Florida. Amtrak has been designated as the operator of the Orlando project and plans to work with the sponsors of the Texas TGV project and to ultimately play the same role in Texas. We strongly support both of these projects.

Amtrak's intention to play a leading role in the high-speed rail revolution is based on two key motives. First, both types of fast rail will contribute significantly to improving the nation's transportation system and in enhancing regional air quality -- both long-term Amtrak objectives. Our Northeast Corridor experience vividly demonstrates this. Although Amtrak's long-distance service is being recognized as increasingly important to the nation, particularly to rural America, we must also address the critical highway, airport and airway congestion and air quality concerns in our most densely populated transportation corridors. With our extensive experience to date and our nationwide coverage, it is most appropriate that Amtrak assume a leadership role in the inevitable increase that is coming in high-speed rail.

Second, our success in the Northeast Corridor demonstrates that high-speed train service can generate a substantial operating profit, and such profit will play an important role in Amtrak's continuing efforts to eliminate its need for federal operating support. Existing Metroliner Service trains, for example, cover up to 200 percent of their long-term operating costs, thus contributing significantly to Amtrak's overhead and bottom line. Revenues from Amtrak's growing contract commuter operations and from its future high-speed rail operations increasingly contribute to our goal of covering more of our operating costs. However, as discussed in more detail later in my testimony, our experience also demonstrates that it will be virtually impossible for any high-speed system at the outset to fully cover its cost of capital -- both construction and long-term infrastructure maintenance costs -- without substantial public assistance. Federal and state funding for these capital costs -- from the incremental upgrade of existing rail lines to construction of new dedicated rights-of-way -- will be essential if high-speed rail is to progress beyond the Northeast Corridor.

I think it would be useful to detail to the Subcommittee the progress we are making in high-speed rail development in a number of areas, as well as to discuss several other issues that I believe are critical to the successful development of high-speed rail transportation in this country.

Amtrak's Northeast High-Speed Rail Improvement Project

Amtrak is making substantial progress towards its goal of reducing travel time between New York and Boston to under three hours. Over the next four years, Amtrak plans to electrify and upgrade this portion of the Northeast Corridor to permit up to 150 mph operations. The result will be a rail line supporting high-speed intercity passenger trains, numerous commuter rail operations, and freight rail service. Importantly, between 2.5 million and 3 million additional riders are projected to switch from other transportation modes to rail, thereby reducing congestion on the region's highways and at its airports and contributing to improved air quality. Given the very high cost of building dedicated rights-of-way for ultra-high-speed rail systems, this incremental improvement approach is the likely scenario for most early high-speed rail systems in this country in densely populated transportation corridors.

Amtrak has been charged with the responsibility for implementing and managing this construction project. We take this responsibility extremely seriously and have created a highly competent and efficient project organization. I am very confident of Amtrak's ability to achieve all of the project objectives in a manner that will make it a model for high-speed rail construction throughout the United States.

Considerable work is currently underway. This includes:

o Environmental impact analysis: The environmental review underway by the Department of Transportation should be completed by early autumn following publication of the draft Environmental Impact Statement (EIS) in June and the final EIS in September. The review will determine if the electrification of the rail line poses any significant adverse environmental impacts, and if so, what steps Amtrak will have to take to mitigate those impacts.

o Electrification system: In June 1992, Amtrak awarded a contract to a joint venture consisting of Morrison Knudsen Corporation, L. K. Comstock and Spie Group to design and construct the electrification system. Thirty percent design of the system was completed in February. Initiation of the construction phase could begin later this year following completion of the federal environmental impact analysis and the issuance of permits by Connecticut, Rhode Island and Massachusetts.

- Track improvements: Amtrak is undertaking various track improvements necessary to permit up to 150 mph train operations and to reduce long-term maintenance of the rail line. These include installation of additional concrete ties and new continuous welded rail, undercutting, and installation of four high-speed interlockings to permit trains to switch tracks at speeds of up to 80 mph (compared to 40 mph today). Amtrak expects to have significant track work underway during the spring and summer while awaiting completion of the EIS and subsequent commencement of actual construction work on the electrification system.

- Signal system: Amtrak is well on its way to completing installation of a modern train and speed control signal system to permit high-speed operations between New Haven and Boston on both tracks in either direction. This is essential to enable the rail line to handle safely and efficiently high-speed passenger trains along with slower commuter and freight trains. It also will enable Amtrak to remove the existing pole-strung signal line that now runs along the rail line.

The Northeast High-Speed Rail Improvement project is strongly supported in the Northeast by transportation planners and environmentalists and is expected to help generate important regional economic and job growth. The significant ridership impact will help regional compliance with the Clean Air Act and could help to avoid the enormous cost of local airport and highway expansion projects. While it is inevitable that there will be some opposition to electrification and additional train movements from some of those living immediately adjacent to the rail line, the concerns that have been raised to date are the focus of review by the federal government and will be addressed in the Environmental Impact Statement.

High-Speed Rail Equipment Development

Of equal importance are Amtrak's plans to develop a family of standardized high-speed rail passenger equipment components that will result in a consistent high-speed rail service in this country and significantly reduce the cost of producing and maintaining the cars and locomotives. Amtrak is now in the process of preparing specifications for the procurement of the new high-speed trains, resulting in the development in this country of a broader rail car and locomotive manufacturing capability. This will have major implications for national economic development and will act as an important spur to development of high-speed rail elsewhere in the country.

If high-speed rail is to develop outside the electrified Northeast Corridor, however, a new generation of non-electric locomotives capable of high acceleration and sustained speeds of at least 125 mph must be developed. Until recently there has been no market in this country for high-speed rail. Consequently, there has been no incentive for the industry to invest research and development funding for high-speed locomotives particularly for the non-electrified corridors outside the Northeast. Although Congress has appropriated some $14 million to Amtrak to develop such a locomotive (with the capability to also operate electrically under third rail power), to date Amtrak has not been satisfied with the proposals it has received from its manufacturers.

As a result, Amtrak has adopted a two-prong strategy to push industry as quickly as possible towards development of a satisfactory non-electric high-speed locomotive.

- Amtrak has strongly endorsed and agreed to participate in a proposal made by New York State to develop operating and maintenance data on the latest generation turbine engine. Turbine technology, similar to that used to power a jet airplane, permits a lighter-weight locomotive, thereby generating a higher horsepower-to-weight ratio. This should make it easier to produce higher operating speeds. Amtrak's experience to date with its current turbine engines, however, is that they are more expensive to operate and maintain. In addition, acceleration at higher speeds can also be a problem. Under New York's proposal, two of Amtrak's existing turbine locomotives would be rebuilt with the latest version of the turbine engine -- Turbomeca's Makila. The new engines should enable a trainset of two locomotives (each with seating capacity) and three passenger cars to operate at 125 mph. Detailed data will be collected regarding the operation and maintenance of the new engines to determine their capabilities and costs versus the most advanced diesel locomotive technology. Because high-speed non-electric operations may well depend on turbo technology, this test could prove to be an extremely beneficial next step in the development of high-speed locomotive technology for non-electrified rail lines. For Empire Service, these locomotives will also be able to use the electrified third rail system for operation through the Penn Station tunnels to Long Island at acceptable speeds.

  New York State has submitted an Expression of Interest for funding from the Federal Railroad Administration under the High-Speed Technology Demonstration Program (under Section 1036c of ISTEA) in part to undertake such a retrofit of turbine locomotives with the new Makila engine. If New York is awarded a grant for this test, Amtrak would fund the overhaul of the passenger sections of the trainset in order to use the test train as a development base for perfecting new seating and interior components that will be used later this decade in the new Northeast Corridor high-speed trainsets and on other Amtrak equipment. The result would be the first Amtrak owned, non-electrified high-speed trainset in revenue service that would be comparable to world standards.

- Amtrak views procurement of 26 new high-speed electric trainsets for the Northeast Corridor as the most important early step in bringing high-speed rail equipment to the rest of the country. The technology currently being evaluated for these trains includes tilting capability, good acceleration at higher speeds, integrated internal communications, standardized power and comfort subsystems, telecommunications and video systems, and high-speed trucks and suspension systems. A next step would be to integrate these characteristics into a family of high-speed equipment that can be used systemwide, building perhaps on the Makila turbine train mentioned above. As a result, Amtrak will consider including in its procurement for the electrically powered high-speed trainsets the feasibility of substituting acceptable non-electric power units, with a dual-power third-rail capability. These power units could be substituted for the electric locomotive when used on non-electrified rail lines, such as on the Empire Corridor and other routes radiating off the Northeast Corridor, as well as other potential high-speed corridors including the five identified by the Department of Transportation. The non-electric locomotives will be fossil fueled, with three-phase AC drives or hydraulic transmissions to achieve speeds of up to 125 mph, depending on the route profile and curvature. The key technological milestone will be the ability of the new locomotives -- whether diesel or turbo -- to provide extra horsepower for short time periods to generate the high acceleration required to reduce travel time on most routes.

With this strategy, Amtrak hopes to be able to encourage the industry to push the technological envelope as far and rapidly as possible in the development of high-speed non-electric motive power. In this way, Amtrak will help set the standard for high-speed rail equipment development in the nation, much as it is setting the standard for upgrading rail lines to permit high-speed operations. Amtrak will work closely with private industry and state and federal agencies in this effort to advance high-speed locomotive development. With our operating experience and the technical know-how in the industry, we believe that this public/private partnership is the best and most practical way to achieve the research and development necessary to attain high-speed rail service in this country. This is an area that holds much potential and challenge for American manufacturing and, indeed, the future of widespread American high-speed rail may well depend on it.

Funding High-Speed Rail Development

A critical issue that remains to be addressed is how to provide the capital necessary to upgrade existing or build new railroad infrastructure and to acquire the expensive high-speed rail equipment for new service. Funding for equipment is of particular concern since the same set of equipment may operate in many states and hence is less likely to be a candidate for funding under state transportation programs. As the Subcommittee is aware, Amtrak has urged establishment of an intercity passenger rail capital trust fund to support Amtrak's burgeoning capital needs and to help support development of high-speed rail. Representative Al Swift last year introduced a bill that would have established such a trust fund financed with one penny of the federal fuel tax currently allocated to deficit reduction. The bill (H.R. 4414) was co-sponsored by some 30 members of Congress and was supported by a host of transportation and environmental groups.

The difficulties that have developed in the past in jump-starting high-speed rail service in California, Florida and currently in Texas demonstrate just how essential public financial support for high-speed rail development will be. The Swift proposal provides a reasonable and equitable mechanism for meeting both Amtrak's systemwide capital needs and some (but certainly not all) of the public infrastructure investment so critical to new high-speed rail corridors. I strongly urge members of the Subcommittee to consider the merits of the proposal.

Summary of Costs for Developing Existing Freight Railroad Tracks for High-Speed Passenger Corridors

In addition to funding Amtrak's needs for equipment and engineering for off-corridor high-speed corridor operations, multiple other sources of funding must be tapped to bring these objectives to fruition. As pointed out earlier, while the capital costs needed in high-speed operations over existing freight-owned railroad lines are far less than the costs involved in constructing the whole new dedicated railroad required for ultra high-speed passenger service, these costs are still not small. The infrastructure improvement costs for each corridor will be unique to that corridor and will depend on a great many different factors -- quality of track and bridge structure; curvature; signal and train control systems; number of running and passenger tracks; number, location and control of interlockings; number of grade crossings; volume and nature of existing freight and passenger traffic, etc. While it is not practical to reach generalized conclusions about these costs without detailed analysis, it is feasible to list several categories of problems that must as a minimum be resolved in all cases. I list the following as a reasonable sampling of these.

(1) Highway Grade Crossings. All highway grade crossings over which trains will operate at 100 mph or more should be closed or eliminated by overpasses or underpasses. At these speeds, the likelihood of a major derailment with resulting passenger casualties from a collision with an automobile or truck is too great, regardless of the existence of the usual gates and lights protection, which experience shows is often bypassed by irresponsible motorists. These are really highway, not railroad, problems, and it is believed that the major funding for grade crossing elimination should come from highway funds.

(2) Signal Improvements. Under present (and we think appropriate) FRA regulations, passenger train speeds may not exceed 79 mph without signals that register in the locomotive cab or provision of an automatic train-stop system. As a practical matter today, this means the installation of the essential elements of an Automatic Train Control System (ATCS). In many cases this will significantly benefit the freight railroad operation as well, but it is quite expensive to install. A significant part of this cost must come from appropriate state DOTs, community contribution, ISTEA, or FRA. Signal improvements are a critical safety measure.

(3) Running and Passing Tracks and Interlockings. The extent of running and passing tracks and interlockings needed will depend on the volume and nature of the freight and passenger traffic to be accommodated. In a few cases, extensive additional trackage on the same right-of-way may be required, and in almost all cases, some improvements will be needed if high-speed passenger trains are to be added.

(4) Rail, Tie, Bridge and Track Improvements. In many cases, the rail line may have good welded rail, good condition wood or concrete ties, satisfactory bridges, etc., but again significant expenditures may be required to assure the quality required for high-speed passenger use.

Without a significant assured source of capital funding, Amtrak will not be in a position to contribute to the funding required to adapt to existing freight railroad tracks for high-speed passenger service. Even with a capital funding source, Amtrak could not handle more than a modest fraction of the infrastructure improvement costs on a railroad owned by a freight carrier or anyone else. Other sources must be utilized if high-speed corridors are to be developed on existing tracks.

The freight railroads, through the Association of American Railroads, have indicated a willingness to work with Amtrak and others to develop these corridors for high-speed passenger service, but only if they can be guaranteed with no net cost and adequate protection against liability.

Addressing Liability Concerns

A final issue, discussed in Amtrak's 1993 Legislative Report, is presented by the legitimate concerns of freight railroads about potential passenger injury claims resulting from Amtrak, future high-speed or other passenger rail operations over their tracks. Clearly, the potential cost of an unfavorable jury award as a result of a passenger train accident could easily exceed (many times over) the revenues or other benefits received by freight railroads for high-speed operations conducted by Amtrak over their lines.

The factor most responsible for driving up the cost of liability is the ability of juries to award punitive damages when a jury determines, often on highly conflicting evidence, that an employee of a defendant company is guilty of conduct that is more serious than ordinary negligence. Courts have rarely set limits on the amount a jury can award to punish the defendant, and examples abound of punitive damage awards far in excess of the amount required to compensate an injured person for his or her injuries. The threat of such awards often causes defendants (including, unfortunately, Amtrak) to agree to large settlements rather than expose themselves to the risks of a hostile jury.

It is perfectly plain that the freight railroads -- including those that own the trackage in most potential high-speed rail corridors -- will not permit high-speed passenger operations without at least relief from passenger injury liability. Indeed, as noted above, the Association of American

Railroads, which represents the major railroads in this country, has conditioned its support for high-speed rail development over private railroad lines on a requirement that the owners be totally protected from potential exposure to enormously costly passenger injury claims. That condition will require an unlimited indemnification by Amtrak or any other passenger train operator against passenger liability regardless of fault or degree of fault.

Amtrak already faces unlimited liability for punitive damage resulting from injuries it causes to its own passengers. If one were to add to this the liability for punitive damages incurred from indemnifying freight railroads where the freight railroad was at fault, Amtrak likely would be unable to afford to undertake extensive high-speed rail passenger operations outside its own Northeast Corridor. This is why relief from punitive damages is so vital. Only a limited exemption is needed to cover liability to passengers resulting from a passenger train accident. Amtrak is not seeking relief from all punitive damage liability, as is provided for claims against the United States and under various state laws with respect to commuter agencies, but rather only relief from punitive damage awards resulting from passenger injuries. I firmly believe that this is essential if we are to extend our operations to include high-speed trains over freight-owned rail lines.

This is an extremely important issue with enormous repercussions on the development of high-speed rail on privately owned railroad rights-of-way. Amtrak urges Congress to address this issue before liability concerns block the path of high-speed rail development in some of the nation's most heavily traveled transportation corridors.

Conclusion

High-speed rail can play an important role in helping to address the nation's transportation and environmental needs. For our part, Amtrak intends to be a leader in developing high-speed rail technologies and in operating the nation's high-speed rail systems. We are the most experienced in the country in this area and, in many ways, our successful involvement in high-speed rail transportation will determine our success in the future. Amtrak looks forward to working closely with the Subcommittee in shaping a high-speed rail future for this country.

MONDAY, MARCH 15, 1993.

SOUTHWEST AIRLINES

WITNESS

HERBERT D. KELLEHER, PRESIDENT AND CHAIRMAN OF THE BOARD, SOUTHWEST AIRLINES

Mr. CARR. Mr. Kelleher. You have given some thought to high-speed rail from a particular perspective. Would you give us your recommendations?

Mr. KELLEHER. Mr. Chairman and Mr. Wolf, as unfortunate and as unseemly as it might appear, I am the founder and the chairman, president and chief executive officer of Southwest Airlines. Southwest is America's privately financed, unsubsidized, shorthall, extraordinarily high-speed, intercity mass transit system. We began in 1971 with three Boeing 737s flying to three cities: Houston-Dallas-San Antonio, the so-called Texas Triangle. Coincidentally, that is one route now being promoted by high-speed rail interests. Today, Southwest is the seventh largest air carrier in America, based on the number of domestic customers served, and we presently operate 1465 Boeing 737s. We first turned a profit in 1973 and have been profitable every year since, including the last three years which have been so disastrous for our industry.

While we have grown each year and we have over 12,000 employees, we remain today essentially what we were in 1971, a shorthall, high frequency, very high speed, point to point, very low fare transportation system. Let me give you examples of what I mean. Today we have 79 daily flights in the Houston/Dallas city pair market which is 239 miles. We have 27 daily flights between Houston and San Antonio, which is 192 miles. We have 28 daily flights between San Antonio and Dallas which is 247 miles. We have 22 daily flights between Houston and Austin which is 152 miles and 24 daily flights between Austin and Dallas which is 183 miles. That amounts to a total of 180 daily flights in the Texas triangle alone.

System wide we have 1400 daily flights to 36 airports in 15 States. We must be doing at least a fair job of serving these markets because, first of all, two to three times as many people began flying in them after we started service and reduced preexisting unrestricted fares by 60 to 80 percent. Eleven times we have achieved first place in DOT's quality ratings for on time performance, baggage handling and customer satisfaction. We call that a triple crown. No other airline has ranked number one in all three categories for a single month. And while I am bragging, let me point out that our full year performance was so good in 1992 that Southwest's employees earned the first ever annual triple crown.

What do we know about high-speed rail? Plenty as it turns out. In 1986 we began talking to the Germans and thereafter the French high-speed rail interests. Both the Germans and the French had a problem. They had train manufacturers and sellers, they had general contractors, they had public relations advisors, they had legal teams, they had people to work the legislative process, but they did not have anyone to invest in their consortia and they did not have anyone to run their trains. For a many billion dollar project these constituted gaping holes in their plans.

After hearing the Germans and the French out, our senior management group met. I told each one that Southwest's transportation mission, our unique market niche had not changed. But I also told them that if there were a better way to fulfill our mission, such as using fast trains instead of airplanes, then our pilots should be wearing engineer's caps and blowing whistles. I reminded them that the U.S. railroad industry had missed a golden opportunity to capitalize on the advent of modern aviation technology earlier in the century, when it became apparent that planes were much faster and more convenient than trains.

So look at it, we did. We examined their proposals. We researched the technology. We studied the proposed projects in Florida and California as well as the one in Texas. We read government reports. We analyzed our customers. We scrutinized our own operations and markets. We even commissioned a study by the Graduate School of Business at the University of Texas as a check against our own analysis. After all of this, we concluded that a proposed high-speed train system in Texas would yield financial losses of an unprecedented magnitude. The project clearly could not be successful without an enormous infusion of public funds. As a private venture, very high speed rail was a "non-starter." So, we turned the Germans and the French down. Frankly, they were not happy little campers. They have been snapping at our heels ever since.

Let me share with you some of the fruits of our labors in this with respect. These findings do not relate to the speculative costs associated with the proposed maglev trains nor do they relate to the feasibility of such high-speed rail as the tilt train, which Mr. Claytor addressed and which has been proposed for the Amtrak line in the Northeast Corridor. The tilt train may turn out to be suitable for certain markets like the Northeast Corridor from the requisite demographic density exits, but where that density tends to preclude acquisition of the right-of-way for the completely secure, grade separated track required by high-speed rail. Rather my comments address high-speed rail systems such as those proposed for Texas using the French TGV train sets.

The hearings conducted by the Texas High Speed Rail Authority with respect to the TGV project produced valuable evidence, much of which, unfortunately, never found its way into the authority's findings, when the State agency decided to jump on to the TGV bandwagon. Nonetheless, that evidence is part of the official record.

An analysis of that record and the other data available to us should convince the objective and disinterested reader that high-speed rail cannot be built, maintained, and operated without bankrupting public and private treasuries alike. The inherent financial weaknesses of rail were so apparent to members of our State legislature that the enabling statute for the Texas High Speed Rail Authority expressly prohibits use of public funds for building or operating any train. In Texas, in fact, the legislature refused to appropriate funds for the operation of the agency itself. The Texas High Speed Rail Authority is funded by the franchise applicants, not by the State. In retrospect, this was very prudent because if this Nation were so fortunate as to have a budget surplus today, high speed rail would convert it to a deficit in short order. Here are just some of the reasons why TGV type rail will fail.

Three reasons are cited in my written testimony, Mr. Chairman, and in most cases proceed from findings made by the independent advisors to the high-speed rail authority. They were firms selected by the high-speed rail authority to report to the feasibility of high-speed rail in Texas and these are the reports that they returned to that authority.

Number one, financing needs projected by Texas TGV through 1998 are $5.9 billion. Assuming the availability of tax-exempt financing (which this "private" venture is now lobbying Congress to obtain), the size of the bond issue will exceed the largest tax-exempt issue ever brought to market by 100 percent. Mind you, this is not for a national system; this is just for the Texas project. As a matter of fact the money that is proposed to be spent on this exceeds the book value of the entire fleet of American Airlines which serves thousands of routes over five continents around the world.

Number two, TGV's project costs are understated by approximately $1 billion. Costs of electrification alone were understated by $500 million. Nor, on the projected revenue side, does the proposal consider the differences between European and American transportation systems, such as: European distances are shorter; Europe has a history of rail acceptance; European gasoline prices are more than double prices in the U.S.; European air travel is less common and more expensive than in the U.S.

Three, the potential ridership is overstated. The approach taken by TGV in its forecasting present, I quote, "just too many opportunities for error, bias, and compounding." The ridership forecasts failed to consider material differences between Texas and France. These include: A, higher population density in France; b, an excellent supplementary (conventional) rail system that feeds the TGV in France; c, a level of air service in competing markets in France which is only a fraction of the level of air service in Texas and much higher French airfares; d, a lower level of motor vehicle ownership in France, coupled with much higher fuel prices.

Four, there is no evidence that a privately financed high-speed rail system in Texas is feasible. This is hardly surprising in light of admitted project costs and the reliance on debt instead of equity.

Five, the Texas project is not unique with respect to costs. No new high-speed rail system in the U.S. could cover its capital and operating costs.

This is the report by the independent advisors to the Texas High-speed Rail Commission. Those differences include a higher population density for instance. America has been suburbanized, France has not; an excellent supplementary rail system that feeds the TGV in France; a level of air service in competing markets in France that is only a fraction of the level of air service in Texas; and a lower level of motor vehicle ownership in France coupled with higher fuel costs. There is no evidence that a privately financed high-speed rail system in Texas is feasible. This is hardly surprising in light of admitted project costs and the reliance on debt instead of equity. The Texas project is not unique with respect to costs. No new high-speed rail system in the U.S. could cover its capital and operational costs. This subsidy is typical—and this is from the transportation research report—would range from $13 to $187 per passenger. The worst case scenario assuming higher than anticipated costs and stronger than anticipated competition, may I be so bold as to suggest from Southwest Airlines would require subsidies as high as $211 per passenger. Incidentally, if Southwest Airlines had a subsidy of just $100 per passenger trip, we could fly everyone in the Texas Triangle for FREE and virtually double our revenue at the same time. Our average air fare in all Texas Triangle markets in 1992 was a mere $51.84.

Seven, the losing German applicant in the Texas proceeding admitted the system would entail public subsidies in the 10 figures.

Eight, the TGV looks successful in France because the French government keeps the cost of plane and car travel high.

Nine, contrary to repeated misrepresentations by the train salesmen, the European systems operate at a huge loss. The German rail system has debts of $36.9 billion and had a combined annualized loss last year of $7.5 billion. This is from the former head of this project from Morrison Knudsen. When project revenues are insufficient, they will have to be "augmented" with public assistance if the project is to be built.

This is what the experts have said. I also have a few personal observations. First, I have noticed great and well founded concern about the cancellation and deferment of commercial aircraft orders at The Boeing Co., entailing a large loss of American jobs and a large diminution in American exports. Much of this concern surrounds the fact that Boeing must compete with the Airbus consortium, headquartered in France and subsidized by the governmental coffers of four European nations.

Even thinking of subsidizing foreign trains against American built airplanes presents the prospect of an enormous inconsistency in governmental policy. As an illustration, Southwest is an American company which buys commercial aircraft solely from The Boeing Co.; it has provided the launching orders that enabled Boeing to undertake production of two of its new 737s, the 300 and the f00; has 145 Boeing 737s in its fleet; it just ordered an additional 34 Boeing 737-300s; it plans to acquire 113 Boeing 737s between now and 1999, worth approximately $4 billion; and Southwest will be honored at The Boeing Co. in July 1993 when it receives the 2500th 737 manufactured by Boeing. The Boeing 737 is, in fact, the largest selling commercial jet aircraft in history—and Southwest Airlines has played a significant part in its becoming so.

TGV contends that it would capture 67 percent of Texas airline passengers in the city pair markets that it services. If it did so, Southwest Airlines would require a lot less 737s from The Boeing Company. Is it possible that our own government would object to a foreign subsidization of a Boeing competitor while itself subsidizing another foreign competitor against Boeing; French or German high-speed rail? And after all this is not new technology. It is far older technology that the 737–300 or the 500.

The second the confusion that would exist on the subject is understandable since much of America does not realize nor understand that it already has a 500 mile an hour, privately financed, unsubsidized intercity mass transportation system that buys Boeing products. It is called, believe it or not, American commercial aviation. This putative lack of understanding is manifested in an article in the Chicago Reader, a free weekly publication of February 26, 1993, which extols high-speed rail. The article admits, however, that there is a little problem with such rail between Chicago and St. Louis where the one-way fare is now $49 and I quote, "Fares on all the big carriers were driven down by competition by upstart Southwest Airlines," and then the article states, "but given that the airline industry is losing billions of dollars, those fares may not be sustainable." The writer of the article is obviously unaware that Southwest Airlines carried 27 million passengers in 1992, that Southwest Airlines charges such fares throughout the Nation and throughout its system; that Southwest Airlines made record profits of $91 million in 1992 and that Southwest is currently in the process of rebuilding Chicago's Midway Airport and resupplying thousands of jobs there after the demise of Midway Airlines.

Third, as a resident of Texas, I have noticed without surprise that a political furor has erupted as property owners along the train route react with shock and outrage upon learning that their property may be condemned and divided. The TGV required a completely secure, fenced electrified track with absolutely no crossings at grade. Property must either be acquired, which is expensive, or cut in two. Either way people become very upset.

Fourth, rail by its nature is structurally inflexible. In today's transportation world the inability to adjust to market conditions is a sure path to Chapter 11. When the oil and real estate economies collapsed in Texas in the mid-'80s, Southwest did not fold, we adjusted. We took our key assets, Boeing airplanes, and flew them to where the markets were expanding; the southeast, the midwest and the Far East. We moved with the alacrity of an eagle.

Trains go from point A to point B and back again forever.

Proponents of high-speed rail ask merely to be placed on a level playing field with aviation. Aviation should be so lucky. If rail gets the level field that it asks for, the numbers just get worse. Commercial aviation in the United States is self-supporting through the elaborate and expensive system of user fees we pay.

Good morning, Mr. Coleman. We just met earlier.

Mr. **Coleman**. I am right on time.

Mr. **Kelleher**. The 10 percent Federal ticket tax. PFCs, airport rental charges and concession fees, airport landing fees, State and local jet fuel taxes and the myriad other Federal, State and local taxes we pay all combine to make us a pay-as-you-go system.

The train sellers say aviation is subsidized. This is the classic debater's trick of telling a lie by not telling the whole truth. Aviation, with the exception of commercial aviation, is subsidized. Those F-16s and those corporate jets take up air space too. But according to the most comprehensive study on the subject yet done, domestic commercial airlines make 111.2 percent of our share of the fully allocated Federal costs of the Nation's airport and airway system. And this calculation was done before the ticket tax was increased by 25 percent or by $1 billion a year in 1990, and before Congress authorized airports to levy passenger facility charges.

That is why the Congressional Budget Office said in its 1985 report that while intercity rail received a net Federal subsidy of 23 cents per passenger mile, which equals $56.81 in subsidy per passenger for a Dallas/Houston trip, commercial aviation got a negative 2 cents per mile, two tenths of a cent per mile, because the Congressional Budget Office user fees to the government exceeded Federal spending.

Incidentally Southwest Airlines' total cost per passenger mile is 7 cents or less than one-third of the subsidy received by intercity rail in this country.

In its updated 1992 report, the Congressional Budget Office analyzed the means of paying for transportation and stated that, and again this is a quote from the Congressional Budget Office, "Commercial air carriers may object to an increase in the tax on passenger tickets when they are already paying more than the cost they impose on the system."

Perhaps the tilt train will be the answer to Amtrak's problems in the Northeast Corridor where the benefits of rail travel may be easier to envision. Public funding of the boondoggles like the project TGV proposes in Texas will add only a few jobs. Our industry is currently engaged in a mighty struggle for survival. We do not need nor can we stand unfair competition from the Federal Government.

I recently told a reporter who asked me why Southwest Airlines was consistently profitable, that Southwest was like the humble bumblebee. It doesn't work in theory but it does in practice. High-speed rail is more akin to an irksome ostrich. It will cause a stir, as it runs about, but it will never get off the ground.

Thank you.

Mr. CARR. Thank you, Mr. Kelleher.

[The prepared statement of Mr. Kelleher follows:]

TESTIMONY OF HERBERT D. KELLEHER
BEFORE THE HOUSE APPROPRIATIONS COMMITTEE
SUBCOMMITTEE ON TRANSPORTATION
AND RELATED AGENCIES

MARCH 15, 1993

My name is Herb Kelleher. I am the Chairman, President, and CEO of Southwest Airlines Co. Southwest is America's privately financed, unsubsidized, shorthaul, high speed, intercity mass transit system.

We began in 1971 with 3 Boeing 737s flying to 3 cities: Houston-Dallas-San Antonio, the so-called Texas Triangle. Coincidentally, that is one route now being promoted by high speed rail interests. Today, Southwest is the 7th largest air carrier in America, based on the number of domestic Customers served, and we presently operate 145 Boeing 737s. We first turned a profit in 1973 and have been profitable every year since, including the last three years which have been so disastrous for our industry. While we have grown each year, and have over 12,000 Employees, we remain today what we were in 1971: a shorthaul, high frequency, very high speed, point-to-point, very low fare transportation system.

Let me give you examples of what I mean. Today, we have 79 daily flights in the Houston-Dallas city pair market (239 miles); 27 between Houston-San Antonio (192 miles); 28 between San Antonio-Dallas (247 miles); 22 between Houston-Austin (152 miles); and 24 between Austin-Dallas (183 miles); for a total of 180 daily flights in the Texas Triangle. Systemwide, we have almost 1400 daily flights to 36 airports in 15 states. We must be doing a fair job of serving all of these markets because, first of all, two to three times as many people begin flying in them after we start service and reduce preexisting unrestricted fares by 60-80%. Secondly, 11 times we have achieved first place in DOT's monthly quality ratings for ontime performance; baggage handling; and Customer satisfaction. We call that a "Triple Crown." No other airline has ranked #1 in all 3 categories for a single month. While I'm bragging, let me also point out that our full year performance was so good in 1992, Southwest Employees earned the first ever annual "Triple Crown."

What do we know about high speed rail? Plenty as it turns out. In 1986, we began talking to the German and, thereafter, the French high speed rail interests. Both the Germans and the French had a problem. They had train manufacturers and sellers; they had general contractors; they had public relations advisors; they had legal teams; they had people to work the legislative process; but they did not have anyone to actually invest in their consortia and run their trains. For a many-billion dollar project, these constituted gaping holes in their plans.

Incidentally, I noted in the Washington press last week that one of the biggest promoters of the French trains, Morrison Knudsen Co., has hired ex-Federal Railroad Administrator Gil Carmichael as a Senior Vice President. The article didn't say if they had yet found an operator for their train.

After hearing the Germans and the French out, our senior management group met. I told each one that Southwest's transportation mission, our unique market niche, had not changed, but if there were a better way to fulfill our mission, such as using fast trains instead of airplanes, then we should look at it. I reminded them that the U.S. railroad industry had missed a golden opportunity to capitalize on the advent of modern aviation technology earlier in the century, when it became apparent that planes were much faster and more convenient than trains.

So look at it, we did. We examined their proposals. We researched the technology. We studied the proposed projects in Florida and California as well as the one in Texas. We read government reports. We analyzed our Customers. We scrutinized our own operations and markets. We even commissioned a study by the Graduate School of Business at the University of Texas as a check against our own analysis. After all of this, we concluded that a proposed high speed train system in Texas would yield financial losses of an unprecedented magnitude. The project clearly could not be successful without an enormous infusion of public funds. As a private venture, very high speed rail was a "non-starter." So, we turned the Germans and the French down. Frankly, they were not happy little campers. They have been snapping at our heels ever since.

Let me share with you some of the fruits of our labor. These findings do not relate to the speculative costs associated with maglev trains. Nor do they relate to the feasibility of such "high speed" rail as the "tilt train" proposed for the AmTrak line in the northeast corridor. The tilt train may turn out to be suitable for certain markets like the northeast corridor where the requisite demographic density exists, but where that very density precludes acquisition of the right of way for the completely secure, grade separated track required by very high speed rail.

Rather, my comments address high speed rail systems such as that proposed for Texas using the French "TGV" train sets. The hearings conducted by the Texas High Speed Rail Authority with respect to the TGV project produced valuable evidence, much of which, unfortunately, never found its way into the Authority's findings, when the state agency decided to jump on to the TGV bandwagon. Nonetheless, that evidence is part of the official record.

An analysis of that record and the other data available to us should convince the objective and disinterested reader that high speed rail cannot be built, maintained, and operated without bankrupting public and private treasuries alike. The inherent financial weaknesses of rail were so apparent to members of our State Legislature that the enabling statute for the Texas High Speed Rail Authority expressly **PROHIBITS** use of public funds for building or operating any train. In fact, the Legislature refused to appropriate funds for the operation of the agency itself. The Texas High Speed Rail Authority is funded by the franchise applicants. In retrospect, this was very prudent because if this nation were so fortunate as to have a budget surplus today, high speed rail would convert it to a deficit in short order! Here are just some of the reasons why TGV type rail will fail.

1. Financing needs projected by Texas TGV through 1998 are $5.937 Billion. Assuming the availability of tax-exempt financing (which this "private" venture is now lobbying Congress to obtain), the size of the bond issue will exceed the largest tax-exempt issue ever brought to market by 100%. Mind you, this is not for a national system; this is just for the Texas project.[1]

2. TGV's project costs are understated by approximately $1 Billion. Costs of electrification alone were understated by $500 Million. Nor, on the projected revenue side, does the proposal consider the differences between European and American transportation systems, such as:

   a) European distances are shorter;
   b) Europe has a history of rail acceptance;
   c) European gasoline prices are more than double prices in the U.S.;
   d) European air travel is less common and more expensive than in the U.S.[2]

3. The potential ridership is overstated. The approach taken by TGV in its forecasting presents "just too many opportunities for error, bias, and compounding." The ridership

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[1] Rauscher, Pierce Refsnes, Houston, Texas, and The Hadley Group, Boston, Massachusetts. Report of the Financial Advisors on the Analysis of Financing Provisions of Franchise Applications submitted to the Texas High-Speed Rail Authority. March 8, 1991.

[2] Sverdrup Corporation. Report on the Engineering and Systems Aspects of the Franchise Applications to the Texas High Speed Rail Authority. 1991.

forecasts failed to consider material differences between Texas and France. These include:

a) higher population density in France;

b) an excellent supplementary (conventional) rail system that feeds the TGV in France;

c) a level of air service in competing markets in France which is only a fraction of the level of air service in Texas, and much higher French airfares;

d) a lower level of motor vehicle ownership in France, coupled with much higher fuel prices.[3]

4. "There is no evidence that a privately financed high speed rail system in Texas is feasible."[4] This is hardly surprising in light of admitted project costs and the reliance on debt instead of equity.

5. The Texas project is not unique with respect to costs. No new high speed rail system in the U.S. could cover its capital and operating costs.[5]

6. Therefore, subsidies in a "typical case" would range from

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[3] Texas Transportation Institute, Texas A&M University. Ridership and Related Issues. A Review of the Applications for Development of a Texas High Speed Rail Service Prepared for the Texas High Speed Rail Authority. February 15, 1991.

[4] Bureau of Business Research, University of Texas at Austin. A Review of the Economic Feasibility of a Privately Finance High Speed Passenger Rail System in Texas. November, 1990.

[5] Transportation Research Board, National Research Council. "In Pursuit of Speed." November, 1991.

$13 - $187 PER PASSENGER. The worst case scenario (assuming higher than anticipated costs and stronger than anticipated competition, such as from Southwest Airlines) would require subsidies as high as $211 per passenger.[6] Incidentally, if Southwest Airlines had a subsidy of just $100 per passenger trip, we could fly everyone in the Texas Triangle for FREE and virtually double our revenue at the same time. Our average air fare in all Texas Triangle markets in 1992 was a mere $51.84.

7. The losing German applicant in the Texas proceeding admitted the system would entail public subsidies in the 10 figures (Guess that's why they lost!).[7]

8. The TGV looks successful in France because the French government keeps the cost of plane and car travel high.[8]

9. Contrary to repeated misrepresentations by the train salesmen, the European systems operate at a huge loss. The German rail system has debts of $36.9 billion and had a combined annualized loss last year of $7.5 billion.[9]

10. When project revenues are insufficient, they will have to

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[6] Id.

[7] Application of "FasTrac" on file with Texas High Speed Rail Authority.

[8] "The Little Engines That Can't." *Newsweek*, January 27, 1992.

[9] "To Track Unity in Europe, Watch Its Fast Trains", *New York Times*, October 25, 1992.

be "augmented" with public assistance if the project is to be built.[10]

This is what the experts have said. I also have a few personal observations. First, I have noticed great and well founded concern about the cancellation and deferment of commercial aircraft orders at The Boeing Co., entailing a large loss of American jobs and a large diminution in American exports. Much of this concern surrounds the fact that Boeing must compete with the Airbus consortium, headquartered in France and subsidized by the governmental coffers of four European nations.

Even thinking of subsidizing foreign trains against American built airplanes presents the prospect of an enormous inconsistency in governmental policy. As an illustration, Southwest is an American company which buys commercial aircraft solely from The Boeing Co.; has provided the launching orders that enabled Boeing to undertake production of two of its new 737s, the 737-300 and the 737-500; has 145 Boeing 737s in its fleet; just ordered an additional 34 Boeing 737-300s; plans to acquire 113 Boeing 737s between now and 1999, worth approximately $4,000,000,000; and will be honored at The Boeing Co. in July, 1993 when it receives the 2500th 737 manufactured by Boeing. The Boeing 737 is, in fact, the largest selling commercial jet aircraft in history--and Southwest

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[10] Testimony of James N. Ellis, Group President, Morrison Knudsen Corporation [member of the TGV consortium] before the Senate Committee on Commerce, Science, and Transportation. August 6, 1992.

Airlines has played a significant part in its becoming so.

TGV contends that it will capture 67% of the Texas airline passengers in its city pair markets. If it did so, Southwest Airlines would require a lot less 737s from The Boeing Co. Is it possible that our own government could object to foreign subsidization of a Boeing competitor while itself subsidizing yet another foreign competitor against Boeing--French or German very high speed rail? And after all, such high speed rail is not new technology--it is far older technology than the Boeing 737-300 or 737-500.

Second, the confusion that could exist on this subject is understandable, since much of America does not realize nor understand that it already has a 500 mile an hour; privately financed; unsubsidized; intercity mass transportation system that buys Boeing products. It is called American commercial aviation. This putative lack of understanding is manifested in an article in the Chicago *Reader*, a free weekly publication, of February 26, 1993, which extols high speed rail. The article admits, however, that there is a little problem with such rail between Chicago and St. Louis, where the one way fare is now $49.00 because "Fares on all the big carriers were driven down by competition from upstart Southwest Airlines", and then states "but given that the airline industry is losing billions of dollars those fares may not be sustainable." The writer of the article obviously is unaware that Southwest Airlines carried 27,000,000 passengers in 1992; charges such fares throughout the nation; made record profits of $91,000,000 in 1992, and is in the process of rebuilding Chicago's own Midway Airport and resupplying thousands of jobs there after the demise of Midway Airlines.

Third, as a resident of Texas, I have noticed without surprise that a political furor has erupted as property owners along the proposed train route react with shock and outrage upon learning that their property may be condemned and divided. The TGV requires a completely secure (i.e., fenced), electrified track with absolutely no crossings at grade. Property must either be acquired (very expensive) or cut in two. Either way, people become very upset.

Fourth, rail by its very nature is structurally inflexible. In today's transportation world, the inability to adjust immediately to market conditions is a sure path to Chapter 11. When the oil and real estate economies collapsed in Texas in the mid-80's, Southwest did not fold; we adjusted. We took our key assets, Boeing airplanes, and flew them where markets were expanding instead of tumbling. We expanded in the Midwest, the Southeast, and the far West. And we moved with the alacrity of an eagle. Trains go from Point A to Point B and back again--FOREVER.

Proponents of high speed rail ask merely to be placed on a "level playing field" with commercial aviation. Aviation should be so lucky! If rail gets the "level" field they ask for, their numbers just get worse. Commercial aviation in the U.S. is self-supporting through the elaborate and expensive system of "user fees" we pay. The 10% federal ticket tax; PFCs; airport rental charges and concession fees; airport landing fees; state/local jet fuel taxes; and the myriad other federal, state, and local taxes we pay all combine to make us a "pay as we go" system. The train sellers say "aviation" is subsidized. This is the classic debaters trick of telling a lie by not telling the whole truth. "Aviation" in all its forms and manifestations, with the exception of commercial aviation, is subsidized. Those F-16's and corporate jets take up airspace too. But, according to the most comprehensive study on the subject yet done, domestic commercial airlines pay 111.2% of our share of the fully allocated federal cost of the nation's airport and airway system.[11] And this calculation was done **BEFORE** the ticket tax was increased by 25% in 1990 and before Congress authorized airports to levy passenger facililty charges.

That's why the Congressional Budget Office said in its 1985 report that while intercity rail received a net federal subsidy of 23 cents per passenger mile ($56.81 in subsidy per passenger for a Dallas-Houston trip) commercial aviation got a negative 0.2 cents per mile because "user fee payments to the federal government exceeded federal spending."[12] Incidentally, Southwest Airlines' total cost per passenger mile is about 7 cents, or less than one-third of the subsidy received by intercity rail.

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[11] "Airport and Airway costs: Allocation and Recovery in the 1980s." Federal Aviation Administration, February, 1987. Report #FAA-APO-87-7.

[12] The Federal Budget for Public Works Infrastructure, Congressional Budget Office, July, 1985.

In its updated 1992 report, the CBO analyzed the means of paying for transportation and stated that the "commercial air carriers may object to an increase in the tax on passenger tickets when they are already paying more than the costs they impose."[13]

Perhaps the tilt train will be the answer to AmTrak's problems in the northeast corridor where the benefits of rail travel may be easier to envision. Public financing of boondoggles like the project TGV proposes in Texas, however, will merely add a few "quick jobs" at the expense of the quality jobs commercial aviation has already created. Our industry is currently engaged in a mighty struggle for survival. We do not need, and cannot stand, unfair competition from the federal government.

I recently told a reporter, who asked me why Southwest was consistently profitable, that Southwest was like the humble bumblebee--it doesn't work in theory, but it does in practice!

High speed rail conjures up a different image. It's more akin to the irksome ostrich--it will cause a stir as it runs about, but will never get off the ground.

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[13] "Paying for Highways, Airways, and Waterways: How Can Users Be Charged?" Congressional Budget Office, May, 1992.

MONDAY, MARCH 15, 1993.

ASSOCIATION OF AMERICAN RAILROADS

WITNESS

EDWIN L. HARPER, PRESIDENT AND CHIEF EXECUTIVE OFFICER

Mr. CARR. Mr. Harper.

Mr. HARPER. Thank you. Thank you very much. I am honored to be with you this morning and to serve on this distinguished panel. I thank you for the invitation to submit my written statement and I will make a few brief oral remarks.

I think it is interesting for the purpose of this panel that the United States and Canada have split their passenger services from their freight services with the government retaining control of the passengers services.

This happened in the United States in 1971 with the creation of Amtrak. Part of the background of that was that the railroads at that time were losing about $200 million a year. Translated into today's dollars, that is almost $900 million a year from the services they were offering.

At that time, the freight railroads paid a one-time fee to exit the passenger business of roughly $800 million. Well, the freight railroads were in bad shape in the 1970s even after exiting the passenger business. There were two bankruptcies, with liquidations and the return on investment in a capital-intensive industry was less than 2 percent.

In 1980, the Staggers Act was passed, which basically deregulated the railroads in the United States—freight railroads—and the system inched away from death's door with a return on investment getting today up to 8-1/2 percent.

With that improved situation, the railroads were able to improve the quality of the freight service, improve the safety of their operation, and to meet the obligations to their employees in one of the most radical and painful downsizing that any industry has gone through in the United States.

I mentioned that our return on investment in the freight rail system is about 8.6 percent. That is much better, but not good enough. Our cost of capital is 11.3 percent and with that differential we still have to go out every year and find $3.5 billion to invest in our privately owned, privately maintained right-of-way systems and come up with another billion dollars a year to replenish the rolling stock of freight railroad systems.

Thus the freight railroads approach the issue of high-speed rail passenger service somewhat cautiously, that they are ready to come to the table to discuss on a business basis the use of their most important asset, the use of their privately-owned, privately-maintained right-of-way, its use for a high-speed rail passenger service.

Again, I would emphasize, as Mr. Kelleher did, that the kind of service we are talking about is below 150 miles a hour. The ultra high-speed service, such as maglev, really requires a kind of asset and right-of-way which the freight railroads do not have. Thus the freight railroads are prepared to come to the table, discuss how this can be done looking at it on a mile-by-mile, very practical businesslike basis, but are not prepared to take on additional costs or additional liabilities to provide the service.

Thank you very much.

[The prepared statement of Mr. Harper follows:]

TESTIMONY OF

EDWIN L. HARPER

PRESIDENT AND CHIEF EXECUTIVE OFFICER

ASSOCIATION OF AMERICAN RAILROADS

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION

HOUSE APPROPRIATIONS COMMITTEE

MARCH 15, 1993

Mr. Chairman and Members of the Subcommittee, the Association of American Railroads (AAR) is pleased to respond to your invitation to appear today on the subject of high-speed rail passenger service.

Recently, AAR broke new ground with the announcement of a major policy position regarding the railroad industry and the burgeoning high-speed rail evolution in the United States. The statement was developed in recognition of the increasing support by the public and elected officials for high speed rail initiatives.

The position was of particular significance in that AAR's member roads include Amtrak, the nation's rail passenger service carrier, and its major freight railroads. These roads comprise 92% of the route miles operated in the United States and they carry over 90% of the nation's freight. Apart from the Northeast Corridor, Amtrak's passenger trains operate over the national freight system; as a result, close cooperation and coordination are required. In years to come, many corridors recommended for high speed development could operate along or adjacent to intercity railroad rights-of-way. In consequence, the recently issued policy statement offers definitive guidelines where, in the past, considerable ambiguity existed.

I attach the policy statement and incorporate it by reference in this testimony. It is brief and requires little interpretative comment. I should, of course, be pleased to answer your questions.

In the past, the relationship between freight and passenger service was beclouded by historical precedents. Long after passenger service ceased being able to pay for itself, its deficit operations were imposed upon the railroads as compelled public service obligations. In fact, in the National Railroad Passenger Act of 1971 the freight railroads were required to pay $200 million for privilege of transferring their deficit operations to Amtrak. That marked the end of an unfortunate era.

The freight railroads are happy to cooperate with those interested in furthering high speed rail, however they understandably have no interest in re-entering the passenger business for the privilege of losing money. Their mission as defined by the goals of the Staggers Act is: to provide a safe and efficient rail transportation system, to meet the needs of interstate commerce and the national defense while earning sufficient revenues to remain viable in the private sector. These goals do not preclude cooperation with new high speed rail ventures, but they cannot be ignored. In order for high speed rail projects to succeed, a fair balance must be struck between public and private entities.

With the formation of Amtrak in the early 1970's, the relationship changed. To be sure, there are statutory requirements which affect the relationship between Amtrak and the underlying freight system. Nevertheless, the pattern of dealing has become more businesslike. And that evolution has resulted in better service to the public.

Just as high-speed rail is an emergent feature on the American transportation scene, the policy statement affords a new basis for dealing with the relationships that can be formed - and with those that cannot be.

The new alignment of interests is businesslike; it addresses the realities and is promising.

In conclusion, Mr. Chairman, the Association of American Railroads and its member companies stand ready to assist in the development of any high speed rail initiative and I welcome your questions.

HIGH-SPEED RAIL PASSENGER AND FREIGHT SERVICES:
OPPORTUNITIES FOR PARTNERSHIP

A
Policy Statement
of the
American Railroad Industry

Association of American Railroads
January 25, 1993

EXECUTIVE SUMMARY

1) Rail transportation offers America significant economic, environmental and safety benefits, and is a solution to increasing highway congestion.

2) America's freight railroads are ready to cooperate in the extension and advance of high-speed rail passenger service, as well as in other rail passenger services.

3) There are distinct types of passenger services: commuter, conventional intercity (Amtrak), high-speed and ultra high-speed. These differences must be understood because they control the extent to which rail freight and passenger operations can operate over the same rights-of-way.

4) In general, ultra high-speed rail service (over 150 miles-per-hour) cannot operate compatibly on the freight railroads' rights-of-way. There are fewer limitations on high-speed service (up to 150 mph), but strict safeguards are necessary. Freight railroads already accommodate conventional Amtrak service and viable partnership arrangements normally are possible. The same is true in most commuter areas. Essentially, partnership possibilities must be examined on a case-by-case basis.

5) The formation of partnerships among railroads and sponsors of new passenger rail projects will benefit the public.

6) The full costs of changes in existing freight rail operations to accommodate new passenger operations must be borne by the entity sponsoring the new service.

7) Freight railroads must be indemnified and insured against any and all financial liability arising from accidents affecting passenger services.

AMERICA'S RAILROADS SEEK TO ENHANCE PASSENGER SERVICE

Greater use of railroads will permit America to alleviate highway and airport congestion, decrease dependence on foreign oil, reduce pollution, and eliminate injuries and fatalities associated with automobile and truck transportation.

In both urban and rural areas, highway congestion is growing, and many airports are taxed well beyond their design capabilities.

In some areas, railroad rights-of-way offer already assembled corridors that can be utilized without the cost and environmental degradation associated with highway and new airport construction.

The public interest favors increased reliance on rail service. Railroads are substantially more energy efficient than any form of highway transportation; and energy efficiency implies less air pollution. Railroads are far safer than highway to move both passengers and freight -- and the railroads' safety record has improved over the past 10 years.

For these reasons, policy makers support greater use of railroads to move both passengers as well as freight; similarly, many policy makers support the introduction of high-speed rail passenger service as a national priority. In fact, the High Speed Rail Association has identified more than 40 candidate high-speed rail corridors in the United States and Canada.

America's freight railroads are ready to cooperate in the advance and introduction of high-speed rail passenger service.

Admittedly, technological and operating differences between various forms of railroading sometimes impose limitations on the shared use of some track. As America moves to increase its use of rail to move both passengers and freight, high-speed rail initiatives must be considered on a case-by-case basis to determine their compatibility with existing train operations.

America's freight railroads are prepared to continue their history of cooperation in identifying and solving engineering and operational difficulties, and in assisting public policy makers to reach economically sound choices.

DIFFERENCES IN PASSENGER OPERATIONS MUST BE ANALYZED

Many potential high-speed corridors do not appear to have the potential ridership economically to justify dedicated rights-of-way, and therefore may seek to share trackage with freight operations.

Launching mixed freight and high-speed rail passenger service on the same tracks must, of course, be accomplished without compromising safety or interrupting the efficient movement of freight.

The concept of shared use requires an analysis of the four distinct rail passenger services that might share rights-of-way with freight railroads:

1) Commuter rail provides mass transportation between suburbs and core cities and within combined metropolitan areas. Commuter rail is the fastest growing segment of rail passenger service, and includes lines operated by regional transit authorities (New Jersey Transit, South East Pennsylvania Transit

Authority, Metro North, Long Island Railroad, and Metra) or for such authorities by contract (Amtrak, Burlington Northern, Chicago & North Western, and CSX).

2) Amtrak is a federally owned company that operates coast-to-coast, primarily on rights-of-way owned by freight railroads, and at top speeds ranging from 79 to 90 mph, depending on the availability of cab signals.[1] Apart from its conventional trains, Amtrak owns the right-of-way in the Northeast Corridor between Washington and Boston. Between Washington and New York, Amtrak operates high-speed rail passenger service at speeds up to 125 mph.

3) High-speed rail passenger service is well established in Europe and Japan, and operates at speeds of 100-150 mph between cities generally fewer than 300 miles apart. Federal funding will permit Amtrak to extend its high-speed corridor from New York to Boston. Joining city pairs such as Washington-New York and New York-Boston will result in high-speed service in a corridor of some 500 miles length.

4) Ultra high-speed rail passenger service includes the French TGV and Japanese Bullet trains that operate at speeds at or above 150 mph. Ultra high-speed rail requires new rights-of-way entirely dedicated to this kind of service. It also includes transportation systems using magnetic levitation technology. Except for existing rail lines that are or may be abandoned, it is doubtful that the freight railroads have any assets appropriate for the development of ultra high-speed rail passenger services.

In integrating these types of rail passenger services into rights-of-way owned and maintained by freight railroads, planners and engineers must focus on four key areas:

1) Significantly Different Operating Speeds: High-speed passenger trains travel between 100 and 150 mph, while the speed range of freight trains generally is 30-60 mph. This difference of speed constrains the

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[1] Cab signals allow for continuous display in the locomotive cab of upcoming trackside signals. Cab signals allow the locomotive engineer to adjust speed promptly, rather than waiting until the next trackside signal is in view.

scheduling of freight operations, or requires construction of additional track capacity. Accommodation may not be feasible in all cases.

2) Signal Systems: Generally, signal systems for America's freight railroads are visual trackside systems. High-speed rail passenger operations require speed control and cab signals.[2] Most freight trains, because of their slower operating speeds, do not utilize speed control, and not all freight railroads utilize cab signals. Therefore, additional investments will be required where high-speed rail can be operated over existing rights-of-way.

3) Right-of-Way Protection and Grade-Crossings: High-speed rail passenger operations require total rail-highway grade-crossing protection, which generally means the construction of highway underpasses or overpasses to prevent highway traffic from crossing a rail line at grade. Additionally, high-speed rail corridors may require special protection such as fencing to prevent trespassing and vandalism.

4) Maintenance Requirements: High-speed rail passenger maintenance requirements are substantially greater than those for freight operations. Obviously, ride quality is paramount, and for safety purposes more visual inspections are necessary. In curves, track elevations vary with speed, and this constraint may further limit the areas of compatibility.

PASSENGER/FREIGHT PARTNERSHIPS REQUIRE CASE-BY-CASE REVIEW

Because local circumstances and rail transportation goals vary by region, each passenger service project must be evaluated on a case-by-case basis. While passenger and freight operations can be compatible on the same track, the differences between freight railroad service and ultra high-speed rail passenger service create obstacles that cannot be overcome. In other areas, the potential depends upon the facts.

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[2] Cab signals are defined in fn. 1.

Speed control is a system that detects an overspeed condition by the locomotive and automatically gives an audible warning. If the locomotive is still not operating within the speed restrictions within 25 seconds, the train automatically is brought to a halt.

Recently consummated projects involving commuter rail in Los Angeles, Houston, Denver, Salt Lake City and Northern Virginia are evidence that joint-use agreements can be made that are beneficial to all participants.

After the facts are known, the nature of the partnership between the freight railroad and the passenger service proponent can be assessed. The partnership must be on a business basis. Railroads no longer bear entrepreneurial risk for passenger operations and will enter the arena only on a fully compensatory basis.

It is therefore a matter of equity that the full costs of changes necessary to accommodate high-speed rail passenger service be borne by the public entity sponsoring the high-speed rail passenger project.

Where mixed freight and high-speed rail passenger operations are feasible, leases, parallel easements and/or trackage rights agreements should be negotiated in an arm's length manner.

Another matter of importance is liability in the event of accidents. Freight railroads have no incentive to allow high-speed operations on their lines if they must accept potentially catastrophic, uninsurable financial liabilities. Thus, the freight railroads believe equity demands that they be indemnified against any and all financial liability in the case of passenger operations.

Mr. Carr. I find personally that Mr. Claytor's approach makes eminently good sense. An incremental approach that is based on what we can reasonably achieve in a reasonably short time frame, maybe making a nod or two to the future or at least developing some information and some research which will allow future generations to carry their stewardship forward.

I am very attracted to the comments of Mr. Kelleher regarding the very high-speed rail, at least so far as public dollars are involved. Let me see if I can get the three of you to agree at some level.

Mr. Kelleher, do you have any serious reservations about Mr. Claytor's incremental approach as he laid it out?

Mr. Kelleher. No, sir, Mr. Chairman. I really do not.

Mr. Carr. Mr. Claytor, I know that you probably haven't researched all of the information that Mr. Kelleher gave to us today, but is his point of view about the ultra high-speed rail something worth looking into?

Mr. Claytor. It is certainly worth looking into, but I haven't done any studies on it and am not in a position to evaluate its validity either way.

Mr. Carr. I understand. I understand, too, that you haven't spent a lot of your time looking at the more exotic technologies?

Mr. Claytor. That is correct. I should say that we have been interested in a short-distance magnetic levitation operation because one has been proposed in Florida, which we would be prepared to be the operator of, although we are not participating financially in any way because in my opinion eventually something in the magnetic levitation field may work out to be desirable. But so far there has never been a commercial magnetic levitation venture anywhere in the world, and I think before anyone should look seriously at moving forward with a magnetic levitation operation there should be a relatively short-distance operation commercially so we can find out, whether or not—we don't know the answer—whether or not the components of this system will stand up under daily service, how much it will cost to run it, how much has to be replaced each day, a week, a month, the whole thing.

I think that a short-distance commercial operation of no more than 15 miles or so would be a desirable project from the standpoint of finding out what is the future of magnetic levitation. Beyond that, we are not in a position to even consider anything.

Mr. Carr. This particular committee has had in the past its position of support for research and development for magnetic levitation, but not the deployment of any such system as called for by the Intermodal Surface Transportation Efficiency Authorization.

I would note parenthetically that on a recent visit to Florida, I was informed that the franchise apparently for the Florida maglev runs out in June. They were unsure at the time whether that deadline, already extended, would be extended again.

Mr. Claytor. I agree with that. I don't know what the situation is. My only point was that we don't have information to enable anyone to invest in a long-distance magnetic levitation operation today, in my opinion.

We might be able to justify a short-distance operation in a place in which there is a built-in customer base, such as in Florida. If it were done for 15 miles in Florida, you would probably fill the train every day if it worked, and that is what we want to find out, because it would be a roller coaster-type thing. It would be an amusement park-type of operation, but by doing it and doing it commercially, it has to run eight or ten times a day not as is done now with test facilities once every two weeks.

You find out whether or not the equipment works, how much it costs, whether or not it is worth going ahead with. We think that is information worth getting. How much assistance it is worth from the standpoint of public investment, if that is what it takes, I am not prepared to say, but I think it is a good thing to do from the standpoint of the long-range investigation standpoint.

Mr. CARR. I am scared by your amusement ride. One of the problems of an amusement ride-type of situation is that it generally sparks lots of information about the enthusiasm for the technology itself.

It generally does not reveal the same amount of information to the body politic about operating limitations. I am thinking in particular about the monorail at Disney World in Florida.

I continually have people tell me that that is state-of-the-art and why don't we do that and every community in America should have one and Disney World proves that that is a desirable thing. Yet, if you talk to Disney officials, they will tell you that if they want to move people, they move them on buses; that the monorail is in fact an amusement ride; that fixing one when it is stuck on the rail is a nightmare when they have to preposition cherry pickers to get people on and off, not to mention the maintenance of them.

The Disney World experience proves just the reverse of what the public opinion is having gone to Disney World. We create a maglev version of that and I think we unleash a lot of ambition without knowledge.

Mr. CLAYTOR. Depends on how it works. That is one of the things we would find out. It might not work at all and that would be the end of it.

INTERFACE BETWEEN FREIGHT AND PASSENGER RAIL

Mr. CARR. Another interesting aspect of the discussion here today is the interface between the freight railroad and passenger rail.

Let me make a comment and then pick it apart, if you will. It has always seemed to me that in terms of overall efficiency to our economy, not worrying about which mode and what city and what route, but the overall impact to our economy would be to find some modest funding source. This could elevate the speed and efficiency of all rail, freight and passenger alike, and that that really ought to be the goal, the target, if you will, rather than the sort of human vanity of how fast can we move people.

Any reaction?

Mr. CLAYTOR. My view is that the freight railroads have to be compensated for the net cost of work that is done on their railroad, the net cost. That means that if, for example, with public funds we put in a sophisticated automatic train control system and we eliminate all the grade crossings, that project has significant advantages, cost and service advantages to the freight railroads.

That ought to be taken into consideration and under those circumstances where that can be proved, freight railroads should make a contribution to the cost. But in many cases in some of the slightly used lines that might be used in corridors, that may be not worth anything.

I have said from the beginning the net cost to the railroad has to be reimbursed (this is a private industry) if you are going to undertake that.

The net cost should be reimbursed. I think there are cases in which the advantage to the railroad of eliminating grade crossings, increasing speeds, providing an automatic train control system which would be very desirable where there is enough traffic to support it, is worth money and the railroads ought to contribute to that.

Mr. HARPER. I believe from the studies that we have done of what our customers are seeking in the freight business that while increasing the speed of freight cars once they are on the line could be beneficial, that is probably not our highest priority.

Many of our bottlenecks come on getting cars rolling on the tracks in the first place in our yards, picking up at customer locations. So we have a long list of priorities of things we need to work on. Absolute speed, once we are on the rail, is probably not our highest priority.

Mr. CARR. It does come into play though in terms of scheduling trains, particularly where you don't have dual tracks?

Mr. CLAYTOR. In some cases. You have to look at the individual cases. In some cases, it may not be worth anything in terms of revenue and net cost. In other cases, it might be worth a significant amount.

HIGH-SPEED CORRIDORS

Mr. CARR. The authorization gives us a whopping $5 million for the entire high-speed corridor program.

Mr. Claytor, you talked about how we ought to target our investment, and I think this committee probably agrees with you, that electrification of the Northeast Corridor is the highest priority and completing the Northeast Corridor is something that is on our radar screen. Then you said after that that we ought to target a freight line, I believe, and do you have any in mind?

Mr. CLAYTOR. Well, I think it is going to depend. We haven't done a study on this. Five million dollars allocated for five corridors is not even enough money to do studies on each one and find out more about how feasible it is.

You would have to do one thorough study of a complete line. The one we go to first must be an area that has congestion. It has lots of population and congested traffic in which the results of having a high-speed operation would have important results to the commercial community and to the environment, and go on from there.

The decision really is going to have to be made, I think, partly on a political basis. Congress has to decide which we want to start first. We could pick three or four which, because of population distribution and other factors are high priority, but I think the decision of which one to start on is going to have to be made as a matter of public policy.

Mr. CARR. Between now and the time that you come before us for your 1994 request, perhaps you could have some of your people give us a couple of candidates and a solid recommendation for us as to how we ought to spend up to $5 million if, in fact, we want to spend the entire authorized amount.

I don't think we have had enough guidance on what to do. I dare say one reasonably expensive grade crossing somewhere would probably consume the whole thing, and that is not a good use of taxpayer money.

If we take this money perhaps to learn something more we might benefit everybody.

Mr. CLAYTOR. To me, the fund should be used for studying the characteristics to indicate which ones we ought to go to first, not to do the job. It is so small, it would take peanuts to do the job.

AMTRAK'S HIGH-SPEED LOCOMOTIVE DEVELOPMENT PROGRAM

Mr. CARR. Let's talk about timeframes. Amtrak supplied to our Committee a paper entitled "Amtrak's High-Speed Locomotive Development Program" that was prepared at Senator D'Amato's request.

Mr. CLAYTOR. Yes, by our Engineering Group and by myself, as well and my Chief Operating Officer, Mr. Sullivan, who is behind me.

Mr. CARR. I found this excellent as a very flat, straightforward, non-hyped piece of information and I found it informative. I would encourage all of the Members of the Committee to take the time to read it. It is only five pages long.

I would ask unanimous consent that this be included in the record. What it does avoid is giving the timeframe for development. I understand this would be a guess and a synthesis and I have heard you give it to me privately.

[The information follows:]

AMTRAK'S HIGH-SPEED LOCOMOTIVE DEVELOPMENT PROGRAM

Implementation of high-speed rail in the United States requires two fundamental improvements over conventional rail passenger operations: a railroad infrastructure capable of significantly faster operating speeds; and locomotives capable of high-speed operations. This country has considerable experience in building the infrastructure necessary for high-speed operations and Amtrak is presently utilizing that experience to upgrade the New York-Boston segment of the Northeast Corridor to permit up to 150 mph passenger operations. Unfortunately, while Amtrak's current Northeast Corridor electric locomotives operate at speeds up to 125 mph, this country has no similar experience in developing non-electric motive power capable of sustained passenger train operations at such speeds. Presently, the maximum operating speed for non-electric locomotives in the United States is about 105-110 mph, and acceleration capability diminishes as these speeds are approached.

Amtrak's non-electric locomotives are powered by either a diesel engine which in turn generates electricity to power motors on the axles, or with an oil turbine that drives the trains axles through a hydraulic transmission and shafts much like a highway truck or automobile. The turbine powered locomotives can also operate at limited speeds on the third-rail electrified trackage in New York City tunnels by using a separate 600-volt motor that feeds into the same hydraulic transmission. The turbine technology has been in operation in four countries for over twenty years. Turbine rail technology has attributes of much lighter weight that can improve the horsepower-to-weight ratio of a train and create improved acceleration in some speed ranges. However, the general experience of most railway operators in the world that use turbine powered trains has found the operating and maintenance costs to be higher than with diesel and electric technology. Amtrak's experience with its fleet of 20 turbine locomotives has echoed that situation.

Congress recognized the importance of developing a new generation high-speed locomotive in 1991. It allocated $14 million in funding to the development of high-speed dual-power locomotives, capable of operating non-electrically at high-speed as well as electrically in areas which require electric power (e.g., the New York tunnels). Originally intended to be used on the New York-Boston segment of the Northeast Corridor prior to the decision to move forward with electrification, these high-speed dual power locomotives could be used in:

- New York Empire Service, where trains are required to operate electrically through the tunnels in New York City, but can operate currently at speeds up to 110 mph along portions of the non-electrified right-of-way to Albany.

- New York/Hartford/Springfield service, where electrified Northeast Corridor trains must change to diesel power locomotives for service north to Hartford, Springfield and Boston.
- Atlantic City service, where electrified Northeast Corridor trains must change to diesel for service to Atlantic City.
- Pittsburgh/Harrisburg/New York service, where electrification extends only from New York to Harrisburg.
- Future service to Long Island from the electrified Northeast Corridor and from the New York-Albany line.

Importantly, this country also must develop a non-electric high-speed locomotive capable of rapid acceleration and sustained speeds of 125 mph for use on entirely non-electrified high-speed rail corridors, such as the five corridors recently identified by the Department of Transportation for high-speed operations. No such locomotives currently exist in the United States and examples abroad are limited to Great Britain, Korea, and Thailand. Their development is critical to development of high-speed rail service off the Northeast Corridor.

Following the appropriation by Congress of funding for high-speed locomotive development, Amtrak developed specifications and issued a solicitation for a new generation dual power locomotive (called the AMD-125) capable of 125 mph fossil fuel and 60 mph electric operations pulling eight passenger cars. Amtrak worked closely with private industry to establish realistic design criteria that met the goals of the project. Three companies ultimately submitted proposals for the prototype AMD-125 locomotives -- General Motors and General Electric, which proposed diesel powered engines, and Republic Locomotive, which proposed use of paired turbine engines. Unfortunately, all three bids were found significantly lacking. Deficiencies for some or each of the bids included the inability to meet the 125 mph threshold speed for non-electric operations; excessively high axle weights; and excessively high operating and maintenance costs. In each case, the cost of developing the prototype was so high as to bring into question the very merits of the solicitation.

As a result, Amtrak did not award a contract for development of the new AMD-125 locomotives. Congress subsequently included language in the conference report accompanying the Amtrak Authorization and Development Act of 1992 that reiterated the importance of the development of a "suitable high-speed passenger locomotive for operation in non-electric territory with or without dual power capability." In addition, the conference report encouraged Amtrak to proceed with the procurement of a prototype high-speed light weight locomotive. Amtrak reopened the procurement last fall, giving each party an opportunity to update their proposal and furnish technical assessments of the state of the art and to adjust their monetary offers. The goal was to try to get one or more of the proposals consistent with the specification criteria at a reasonable cost per locomotive. The deadline to respond was December 23, 1992. Again, none of the proposals was compliant.

On January 25, 1993, Republic Locomotive made a new proposal to substitute a single Textron/Lycoming turbine for the two Turbomeca Makila turbines that were in all previous offerings. Since this submission was made well after the closing date for final submissions, it was treated as an "unsolicited proposal." While it may be possible that this proposal, in concept, could overcome the primary area of non-compliance, the proposal was not completely assembled in sufficient detail with regard to trainset performance, integration of this turbine with a matching hydraulic transmission, nor was there sufficient technical data to ascertain how the supplier intended to accomplish the subsystems integration within the locomotive drive train and auxiliaries.

After one year of technical negotiations, it was evident that the public policy goal and operational requirements could not be achieved and that the solicitation was more ambitious than anyone contemplated. Amtrak believes that an alternate approach is warranted. This approach can improve both the technical options and the production economics of a high-speed, dual mode locomotive. Amtrak now believes its goal of a high-speed locomotive could be better achieved through an approach that focuses on development of an integral "trainset", consistent with the high-speed international practices. Accordingly, Amtrak intends to pursue a two-prong strategy for this critically important area.

> Turbomeca Makila Test. First, we have strongly endorsed a proposal made by New York State to develop operating and maintenance data on the latest generation turbine engine. Under this proposal, two existing turbine locomotives would be retrofitted with the Turbomeca Makila engines, a transmission/engine combination that currently exists in Egypt and will soon be introduced into Iranian turbine powered trains. The two new engines should enable a trainset of two locomotives (with passenger seating

capacity) and three passenger cars to operate at 125 mph. Given the considerably higher operating and maintenance cost record with the current turbine engines, testing of this newest generation turbine locomotive will provide Amtrak with valuable operating and maintenance information vis-a-vis diesel powered trains at significantly less risk and cost than full-scale development of a turbine AMD-125 prototype.

Because high-speed non-electric operations may well depend on turbine technology, this test could prove to be an extremely beneficial next step in the development of high-speed locomotive technology for non-electrified rail lines. New York State has submitted an Expression of Interest for funding from the Federal Railroad Administration under the High-Speed Technology Demonstration Program (under Section 1036c of ISTEA) in part to undertake such a retrofit of existing Amtrak turbine locomotives with the new Makila engine. If New York is awarded a grant for this test, Amtrak would fund the overhaul of the passenger coaches in order to use the test train as an advance development base for perfecting new seating and interior components that will be used later this decade in the new Northeast Corridor high-speed trainsets and on other corridors nationwide. The result would be the first Amtrak owned, non-electrified high-speed train set in revenue service that would be comparable to world standards. This demonstration trainset would allow testing of components needed for the Northeast Corridor electric trainsets some 12-18 months in advance of their in-service use on the pre-production electric trainsets. It would also allow testing at the Transportation Test Center and in other designated high-speed corridors.

Non-Electric Powered High-Speed Trainset. Amtrak views procurement of 26 new high-speed electric trainsets for the Northeast Corridor as a critical step in bringing high-speed rail equipment to the rest of the country. The technology developed for these trains -- tilting capability, fiber-optic internal communications, standardized power and comfort subsystems, telecommunications and video systems, high-speed trucks and suspension systems -- will be integrated into a family of high-speed equipment that can be used systemwide. As a result, Amtrak plans to include in its procurement for the high-speed trainsets the development of a dual power system that could be substituted for the electric locomotive when these trains are used on non-electrified rail lines, such as on the Empire Corridor, other routes radiating off the Northeast Corridor, and the five high-speed corridors identified by the Department of Transportation. The non-electric locomotive will be fossil fueled with three-phase AC drives to achieve speeds of at least 125 mph, depending on the route profile and curvature The key technological milestone will be the ability of the new light weight locomotives -- whether diesel or turbo -- to provide extra horsepower for short time periods to generate the high acceleration required to reduce travel time on most routes.

With this strategy, Amtrak hopes to be able to push the technological envelope as far as possible in the commercialization of high-speed non-electric motive power. In this way, Amtrak will set the standard for high-speed rail equipment development in the nation, much as it is setting the standard for upgrading rail lines to permit high-speed operations. Amtrak will continue to work closely with private industry and state and federal agencies to advance high-speed locomotive development. This is an area that holds much potential and challenge for American manufacturing and, indeed, the future of high-speed rail in this nation may well depend on it.

TIMEFRAME FOR DEVELOPING HIGH-SPEED LOCOMOTIVE

Mr. CARR. Given all that you know and what your engineers have done, what is the timeframe for an optimistic and a medium optimism timeframe for the development of a power unit of some kind——

Mr. CLAYTOR. The first stage.

Mr. CARR. To get you to high speed, but not on a electrified line.

Mr. CLAYTOR. The first step of developing a non-electrified locomotive would be the one that I mentioned in my statement of going forward with the installation of the Makila ultra high-power turbine engine in an existing train.

Mr. Sullivan, would you suggest—how soon do you think we can come up with that?

Mr. SULLIVAN. On the Makila engine, we have been working with New York State on putting that in our turbo train. We feel, looking at the supply of those engines, in shortly over one year, we could have the engines and have them installed in a turbine set and operating high-speed service up to 125 miles per hour on the Empire Corridor in the State of New York.

Mr. CARR. This is a turbine train that has essentially a hydraulic drive of some kind?

Mr. SULLIVAN. Yes.

Mr. CARR. But this train—the Turbomecca train-is in the nature of a research train, right? You are going to operate it, but you are retrofitting an old locomotive with a new engine to see what kind of maintenance and fuel consumption you have; is that the idea?

Mr. SULLIVAN. It would be retrofitting an existing turbo liner frame that runs in New York State service today with a Makila engine so we could study the maintenance and operating costs of those engines.

We also intend to redo the interior of that train to a high-speed train set something similar to the X2000 or one of the high-speed trains around the world so that we can test the market.

Mr. CARR. I understand that. I am interested in the speed and acceleration of high-speed phenomena, something airlines are familiar with, but this is not the ultimate train that we are talking about.

Mr. CLAYTOR. No.

Mr. CARR. Given what you know, I know it is a guess, and I will put all the qualifiers in there for you. When would you think the ultimate non-electric high acceleration train might be available? I might say this is important because we deal in money and time frames here and I don't want to invest the taxpayers' money sooner than we can reasonably expect to have some kind of a payoff.

Mr. SULLIVAN. Our goal, Mr. Chairman, is to develop, in parallel with the development of the electric high-speed train set for the Northeast Corridor, either a turbine or a diesel non-electrified train set that could operate somewhere between 125 and 150 miles an hour.

We have prepared a chart and if you would like to have Mr. Michel, our Assistant Vice President of Engineering Design, just briefly run through the development of that.

I believe that we can have that developed by the 1997–1998 time frame right along with the electric train sets.

Mr. Michel is prepared to briefly explain how that would occur.

Mr. CARR. I think that would be most helpful.

Before we leave this topic entirely, I want to get Mr. Kelleher's observations on the maintenance and fuel consumptions of turbine engines. I understand that the applications are a little different, but I would like to have your ideas about that.

Mr. MICHEL. Amtrak is currently in a locomotive program today that is developing the next generation of diesel electric technology, the first of which will be delivered and presented to Amtrak towards the end of April this year.

It is being built by General Electric and is called the AMD–103 program. That locomotive has a conventional diesel engine with an electric generator which rectifies the power to feed to D.C. tractor mode a conventional technology, both freight and passenger.

This locomotive will be capable of a hundred miles per hour maximum speed. There is a possibility we may be able to push that a little further.

The people at GE who fabricated the locomotive have hopes of doing that. We have ordered 10 dual mode-locomotives. We pick up our power off the third rail system in the tunnel and condition it and convert it and feed it to the traction modes. So when shut down in the tunnels, it functions as an electric locomotive.

We are working on specifications for the Northeast corridor electric train sets. We will be using the AC three-phase technology in the traction motors which produces the high speed that we see in the European train sets.

By and large, they are all using this new three-phase technology. Our freight railroads in this country are embarking upon a similar program in traction motors for improved performance, reliability, lower operating costs.

We see this as a natural evolution. This is now. In the electric locomotive for the power source, we have a large transformer that takes power from the overhead wire as we have in the Northeast Corridor. We move to this machine here and if you look carefully you will see a lot of commonality in the components.

We have the diesel engine or it could be a turbine engine driving electric generators as the prime power source, the rectifier and converter. We have a transformer we feed the same traction motors.

By going to the three-phase technology, we have lighter-weight traction motors. We have a vehicle that now has the capability because of the reduction in weight to push that speed to 125, 135, maybe as high as 150.

The laws of physics come into play. As the speed goes up, the horsepower goes up very fast. There is a balance speed. The train power source should be tuned to the specific corridor, the curvature, the grades and desired trip time.

We see this as a natural evolution of these two, the diesel and electric, which can occur almost concurrently.

Very quickly, this chart is a simplified version of our Northeast Corridor Development program. We are writing specifications for a train set for the Northeast Corridor with an electric locomotive.

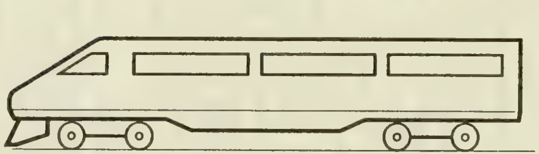
This would be fossil fueled, whether it be turbine or diesel. It is open, 125 plus mile an hour for the national corridors and for the specific applications in New York City or in those areas with air quality issues we see the dual mode capability being a desirable function.

This would be the same performance, but would be able to take power from an auxiliary power source on the roadway.

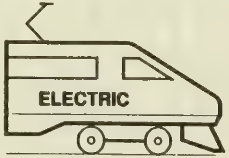
Mr. CARR. We would like to have copies of that for the record.

[The information follows:]

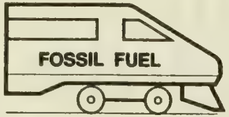
TRAIN SET DEVELOPMENT



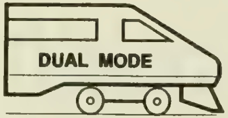
Capacity: 200 to 400 Passengers
Cafe / Phones / Fax
Tilt Capability



- OVHD CATENARY
- 150 MPH
- 3 PHASE AC
- NEC



- DIESEL / TURBINE
- 125+ MPH
- 3 PHASE AC
- NATIONAL CORRIDORS



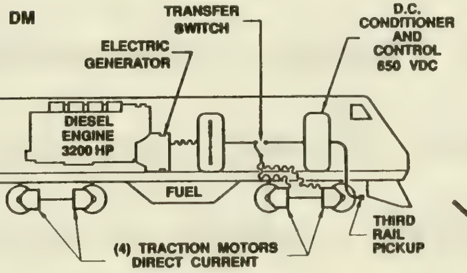
- DIESEL / TURBINE
- 125+ MPH
- 3 PHASE AC
- NEC FEEDERS

Amtrak®

ENGINEERING DESIGN & CONSTRUCTION

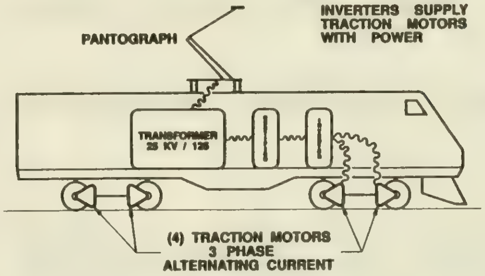
LOCOMOTIVE DEVELOPMENT

AMD 103 DM

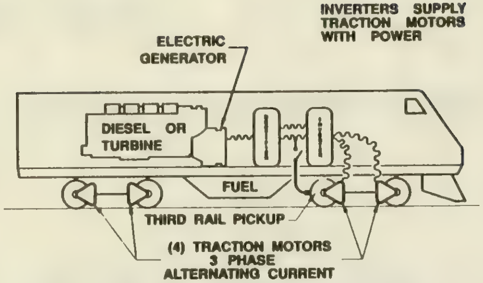


DUAL MODE DIESEL

DELIVERY IN 1994 - 10 UNITS
100 MPH DIESEL - 60 MPH ELECTRIC


PANTOGRAPH
INVERTERS SUPPLY TRACTION MOTORS WITH POWER
TRANSFORMER 25 KV / 125
(4) TRACTION MOTORS 3 PHASE ALTERNATING CURRENT

N E C ELECTRIC TRAIN SET


ELECTRIC GENERATOR
INVERTERS SUPPLY TRACTION MOTORS WITH POWER
DIESEL OR TURBINE
FUEL
THIRD RAIL PICKUP
(4) TRACTION MOTORS 3 PHASE ALTERNATING CURRENT

NON ELECTRIC / DUAL MODE LOCOMOTIVE

Amtrak

ENGINEERING DESIGN & CONSTRUCTION

ADVANTAGES OF THREE PHASE AC TRACTION

- Increased adhesion with rail / reduced wheel slip
- More power per axle
- Lighter weight traction motor / lower unsprung mass
- Improved Dynamic Brake speed range
- Solid State Electrical Controls And Switchgear
- Sealed Motors Reduce Dirt & Water Contamination
- Reduced Fuel Consumption / Exhaust Emissions

AMTRAK'S ROLE IN ULTRA-HIGH SPEED RAIL OPERATIONS

Mr. CARR. Mr. Wolf, do you have any questions?

Mr. WOLF. I thank you, Mr. Chairman. I want to thank the witnesses. I have a couple of questions and then a number I will ask for the record.

It is good to see you again, Mr. Claytor. I think it is worthwhile to make clear for the record that there is a substantial difference between high-speed rail with maximum speeds of 125 to 150 and ultra high-speed rail with maximum speed as high as 200 to 300. I don't think people really focus on the difference.

Mr. CLAYTOR. Yes, sir.

Mr. WOLF. Using that as a base, it isn't difficult to reconcile your testimony and Mr. Kelleher's. You are talking more about ultra high-speed, Mr. Kelleher, and Mr. Claytor is talking about high speed.

Mr. KELLEHER. That is correct, because the project proposed in Texas is ultra high speed.

Mr. WOLF. Do you agree with that?

Mr. CLAYTOR. Yes.

Mr. WOLF. Somebody who just walked in could say "Wow, what a conflict between these two people." It isn't that much of a conflict.

What role, Mr. Claytor, would you say Amtrak would have if we moved on to this ultra high-speed?

Mr. CLAYTOR. We would like to be the operator of any ultra high-speed service because we think we know the most about running fast and very fast trains in this country. We would be an operator under contract with whoever is going to finance and set it up.

We have indicated to the Texas people, Morrison-Knudson and others sponsoring the project, that if it goes ahead, we would be happy to be selected to be the operator, but that we are not in a position to make any contribution to the operation from the standpoint of finance or otherwise.

We have said the same thing about magnetic levitation. If that comes along, we think we are in a position to be the operator, and we have indicated to the people in Florida that if they go ahead, we would like to be the operator.

We will obtain the experience of maintenance and operation of a entirely different system. No one in this country has that know-how, and we think we are in a position to learn it as well as anyone else. That is our role, the only one we have suggested we are prepared to go forward with at this time.

Mr. WOLF. You talked about maglev. You were talking about a demonstration project to see whether it would work or not?

Mr. CLAYTOR. A commercial demonstration project. We already have in Germany and I believe in Japan a couple of facilities. The train runs every two weeks and everybody loves it, but that type of operation doesn't subject the material or the track or anything else to the kind of stress that you run it 8 or 10 times a day would have.

Therefore, if we are going to develop that particular technology any further, the next step it seems to me is to set up something in which it is going to be run 8 or 10 times a day, 6 or 7 days a week and see if it works.

Let's see what goes wrong. Maybe it will work well. Maybe things will fall apart fairly fast and you will have to replace a lot of parts.

Those are the things I think you need to know before you get into that, but we are not prepared to finance that either. We are prepared to be the experimenter that runs it for them.

Mr. WOLF. You want to run everything?

Mr. CLAYTOR. Yes. If it is on rails and maglev, we would like to run it.

DULLES RAIL CORRIDOR

Mr. WOLF. It belongs to Claytor. If it is on rail, it is yours. Does the Dulles corridor fit into that?

Mr. CLAYTOR. We are not a transit operator.

Mr. WOLF. I understand.

Mr. CLAYTOR. One could have a maglev operation or a high-speed operation from Dulles into town, sure. We would love to run that.

Mr. WOLF. I know, but does that make sense in your mind as to a test operation? That distance from Dulles Airport to West Falls Church is around 13 miles.

Mr. CLAYTOR. The distance is probably all right. Probably the cost of building it into a big city——

Mr. WOLF. It wouldn't go into the city. You would interface with Metro at the West Falls Church stop so you are talking about 13 miles, of which all the current right-of-way is currently owned by the FAA.

Mr. CLAYTOR. As a sort of quasi-marketer, I would worry about that because if you are going to the airport, you would have to get on the subway and take a local to West Falls Church and then take something fast to the airport, I think you will have a hard time selling it.

Mr. WOLF. Maybe, but yet you do it in a number of other places.

Mr. CLAYTOR. I would worry about it from a marketing standpoint, but that is not our problem.

LIABILITY

Mr. WOLF. You just want to run it.

One other question you touched on in the testimony, the subject of resolving the liability question to implement high-speed rail services on the Nation's existing freight lines.

Mr. Claytor, you remember that, we were involved with the question of liability in the startup of VRE. It took a long while to resolve.

It is not easy to accomplish. Do you want to make comments about that, using the VRE as an example? Are you optimistic that this could be done relatively easily or would it be difficult?

Mr. CLAYTOR. On the question of——

Mr. WOLF. Or what should be done to make it easier?

Mr. CLAYTOR. The punitive damage problem is what bothers us particularly. It is a punitive damage problem in a very limited area. We are not suggesting protecting us against punitive damages for anything we do, but from a passenger train accident.

From the freight railroad standpoint, they may have somebody who makes a dreadful mistake, a road master gets drunk. He has never been drunk before. There is no reason you would expect him to be drunk. He gets drunk. He misses something. A switch is bad, the train hits the switch. You have a bad derailment and $20 million or $30 million of liability imposed on a railroad.

They get no net compensation for having run this passenger train and I think they are not prepared to face that type of liability.

I think Amtrak now guarantees that there will be no liability up to a point with all the freight railroads that we operate over now. I think we would have to do that, but I think for our own protection, if we are going to take on the liability that is caused by somebody else, we have to have some protection against punitive damages on the freight railroad and on us.

It is a narrow area, but I think in today's world you just can't operate a business with that kind of open-ended liability, which is basically uninsurable.

Mr. **Wolf**. That would be done legislatively?

Mr. **Claytor**. That would have to be done by legislation.

Mr. **Harper**. I would like to add, we have a tremendous commitment to running safe railroads whether they have passengers on them or not and have a great deal of incentive to do that as do all of the employees of the railroads. That is our incentive to run safe railroads. The issue of liability is an overwhelmingly important issue.

Freight railroads are private businesses. The right-of-ways are private assets and we have to approach the issue on a businesslike basis that we think that we can be helpful in the development of high-speed rail systems which could have very significant public benefits.

The business of the freight railroads is moving freight, and if we can be of assistance without it costing us, without taking on additional liability and perhaps a marginal incremental return on our investment, then it is a fine thing to be in. But otherwise our business is moving freight safely and efficiently.

TEXAS HIGH-SPEED RAIL PROPOSAL

Mr. **Wolf**. Mr. Kelleher, I have one question. I was impressed with your testimony. I also have been impressed with the way you have run your airline down there, particularly in this environment when most of the airlines are not doing very well.

Mr. **Kelleher**. Thank you, Mr. Wolf.

Mr. **Wolf**. I think the committee ought to take your testimony and ask OTA or somebody to look at it. If everything you say is accurate, I think you pretty much devastate the TGV proposal.

Are you fairly confident—you say here that the worst-case scenario, assuming higher-than-anticipated costs would require subsidies as high as $211 per passenger?

Mr. **Kelleher**. Yes, sir. That comes from the Transportation Research Board's own report which is headed by a mass transit person who would lean in the direction of holding down the amount of subsidy that might be required.

It has already been established by the independent advisors to the Texas High-Speed Rail Authority that the $5.9 billion figure that was projected for constructing the system in Texas will be exceeded by about a billion dollars, and my own guess would be substantially more than that.

You have the airline in the world, not just in the United States that has the highest frequencies and the lowest fares against which you would be competing. I have no trouble envisioning that it would take an enormous amount of subsidy.

I might say something else that would shed perhaps a little more perspective on this issue. Insofar as competing with Southwest Airlines is concerned, say the $6 billion it will take to build the system the TGV is talking about, Southwest Airlines serves the same routes with an investment of $400 million. It is hard in the private market for an investment of $6 billion to compete against an investment of $400 million.

As a matter of fact, if done on a private basis, the gross revenues wouldn't pay the interest costs of the investment.

Mr. WOLF. Assuming this were built, what would the impact be on your company?

Mr. KELLEHER. Initially, the very high-speed rail people said the system was complementary to air service. That is where they started out. Then subsequently prior to the hearing, they discovered that all the people who were going to be taken out of their automobiles in Texas are already gotten out of them because of Southwest Airlines.

So they told the Texas High-Speed Rail Authority that they would acquire 67 percent of our passengers if they were able to set up their particular system against us.

I am not necessarily suggesting that that is true, but I am suggesting that they themselves portray a very deleterious effect with respect to Southwest Airlines and that would cause a tremendous maladjustment in the entire Texas air system if that should come to pass.

It is like an arterial system where everything is linked to everything else. Passengers are the corpuscles and if there is a branch that the corpuscles are not getting through, then those ahead of it tend to decay.

Flying from Houston to San Antonio to El Paso, for instance, if you took 67 percent of our passengers off the Houston-San Antonio flight, there is no reason to fly that and therefore no reason to fly on to El Paso.

Mr. WOLF. What is the status of this down in Texas? Has the Texas Legislature passed anything? Where is this project now?

Mr. KELLEHER. We agreed with the high-speed rail proponents that it would be very appropriate to create a High-Speed Rail Commission provided that they would agree not to accept any subsidy from government.

Upon that hypothesis, the act went through the legislature creating a High-Speed Rail Commission. The legislature declined to contribute any Texas money to the project and declined to contribute any Texas money even to funding the commission, so TGV pays for the activities of the commission.

The commission has issued a franchise to TGV which is on appeal in the courts. That is fundamentally where it stands.

TGV has just gotten an extension of a year on the date when it has to come up with some equity. It is kind of in suspense as far as progress is concerned.

Mr. WOLF. What are they talking about, should this go forward, with regard to support at the Federal level. You said they were setting up a commission.

Mr. KELLEHER. They are not talking about any support at the Federal level. The TGV group very clearly told the Texas High-Speed Rail Authority that they were going to privately finance this project and were not seeking government subsidy whatsoever.

During the hearing, I tendered to them a written offer saying that "If you will sign this agreement, you will not receive any government subsidy, then Southwest Airlines will withdraw its opposition to high-speed rail."

TGV declined to sign that agreement.

Mr. WOLF. Thank you. I appreciate your testimony.

HIGH-SPEED RAIL SERVICE IMPACT ON AMTRAK SUBSIDIES

Mr. WOLF. Mr. Claytor, testimony has indicated that while high-speed rail will require a Federal investment, it will in the long term move passenger rail service toward financial self-sufficiency. What has been the experience of Amtrak's current Metroliner service in terms of covering its own operating costs?

Mr. Claytor, how quickly could high-speed rail service in other corridors yield dividends in terms of reducing Federal subsidies for passenger rail service?

[The information follows:]

During the last decade Amtrak's Metroliner Service has improved its long-term avoidable profit from $2,630,000 in FY82 to $61,551,000 in FY92, which represents a 51 percent profit margin. This ratio includes costs only directly attributed to operating the service. It does not include the $250 million in annual ownership costs to maintain the corridor's infrastructure and signalling systems to support high-speed and commuter operations.

Our experience demonstrates that it will be virtually impossible for any high-speed system to fully cover its construction expenses and other initial capital costs without public assistance. Although increased maintenance costs for high-speed rights-of-way and equipment are anticipated, these costs should be more than offset by increased passenger revenues and decreased crew costs resulting from improved running times. As a result, we expect that the profitability of high-speed services will be much better than the conventional speed short-distance services that we currently operate outside the Northeast Corridor.

HIGH-SPEED RAIL SERVICE ON BALTIMORE TO RICHMOND CORRIDOR

Mr. WOLF. At what stage are the plans to implement some kind of high-speed rail service in the BWI-Union Station-Dulles-National-Richmond International corridor?

[The information follows:]

The BWI-Union Station portion of the suggested route is already served by Amtrak's high speed Northeast Corridor. Additionally, Washington-Richmond-Charlotte has been named as one of the Federal Rail Administration's six designated high speed rail corridors. We presently have no plans, however, to institute high speed rail service that would connect Union Station with the BWI, Dulles, National, and Richmond International airports.

HIGH-SPEED RAIL SAFETY

Mr. WOLF. How safe is high-speed rail? What will we need to do in safety terms if high-speed rail is to progress beyond the Northeast Corridor?

[The information follows:]

High-speed rail is being demonstrated daily as a safe and effective transportation mode that is more than competitive with the air and automobile alternatives in selected corridors of 100–500 miles in length.

For high-speed rail to move off corridor, the basic safety improvements required would be improvement of grade crossing protection and selected highway grade crossing elimination. The adoption of train control systems and enhancement of existing signal systems, together with the appropriate matching equipment in the trainsets to provide positive train separation and cab signal display are needed.

The geometry of the proposed routes should also be studied with the aim of reducing excessive curvature and speed restrictions imposed by clearances, bridges, and local regulations.

For initial establishment of the marketability of a particular route, initially, an internal combustion locomotive should be used to attain 100–125 mph before the eventual introduction of electrification to achieve better acceleration and speeds in excess of 125 mph.

AMTRAK HIGH-SPEED ELECTRIC TRAIN SETS

Mr. WOLF. Following the testing of the X2000 tilt train, Amtrak plans to procure 26 new high-speed electric train sets. What will that cost? Will these train sets be usable on any other existing corridors?

[The information follows:]

Cost will be determined after receiving competitive proposals from various manufacturers. The ultimate cost would be a factor of the total number of trains ordered, the delivery schedule, and the number of seats required. Prices range from $15 to $24 million per trainset. These trainsets will be equipped to run on electrified territory; but with a non-electric locomotive (diesel/turbine) replacing the electric unit, the passenger-carrying section would be suitable for use on any corridor. This commonality of design and systems can reduce the development cost and technological risk.

NORTH AMERICAN FREE TRADE AGREEMENT IMPACT ON FREIGHT RAIL

Mr. CARR. Mr. Coleman.

Mr. COLEMAN. Thank you, Mr. Chairman.

Mr. Kelleher, I hope you came in on an airline better than we did trying to get into town today. Although I would say to my colleague Mr. Wolf they did a pretty good job of clearing all the roadways, it was tough getting out of some of the neighborhoods.

Mr. Harper, I am interested in your association's efforts particularly as it relates to the freight part of the component that you represent and whether or not you feel we have done the proper amount of anticipation with respect to the North American Free Trade Agreement.

For example, I represent a U.S. Mexico border region. Do you feel rail freight will be a major player at all in this process of moving goods in commerce between our two countries of Mexico and the United States and Canada?

Mr. HARPER. Yes, I do, as a matter of fact.

One of the things that is quite interesting is Mr. Gorge Tomayo, the Director General of the Mexican National Railroad recently joined the Board of Directors of the Association of American railroads. I think that is one more step of further integrating the freight rail system that basically runs from the Guatemalan border to the Arctic circle now.

Although there are lots of historic anecdotes about the problems dealing in Mexico, we are finding the major freight railroads in coordination with the Mexican National Railroad are able to see freight trains arrive on a scheduled basis with 95 on-time arrivals in Mexico City and North of the border.

We are getting tremendous growth in that marketplace and feel we are getting better prepared every day for that.

Mr. COLEMAN. I would be especially interested if you could give us some recommendations. I made a proposal a year-and-a-half ago to former Secretary Card and I am in the process of doing the same with Secretary Pena, proposal with respect to what it is—we in government could do or should be doing in order to assist carriers, whether it is grade upgrades or whether it is helping in another fashion.

Perhaps we can find some method by which we could be helpful from a financial standpoint to get the railroads in this country that are in the business of shipping freight to do even a better job than they are doing.

I know of some instances where the Mexican rail doesn't join United States rail at the same point and there are difficulties in communities on both sides where we don't seem to be able to facilitate the kind of movement that I think would be beneficial to all of us in this country if in fact the vision of North American Free Trade Agreement is through better exchange of commodities between all three countries, will improve jobs and increase efficiencies.

I think rail should play a role and I am hopeful that it can. I would like your recommendations particularly as they apply to the Southern Border and the Northern Border as well.

Mr. HARPER. We would be happy to do that.

I would like to make one or two comments today and supplement this by letter, if I may.

I think one of the concerns we have is the harmonization process going forward with respect to regulations of Canada, the United States and Mexico.

In that respect, I think that we in the freight railroad business feel that the identification of a standardized NAFTA vehicle perhaps in the range of 80,000 pounds gross weight as a proper highway vehicle is one that could move in all the 48 States, all the provinces of Canada and in Mexico, and I think that would be a good solution to some of the highway problems in Mexico as well as with regulations in the United States and Canada.

Another thing that could be useful is facilitating crossing the borders, and facilitating some of the Customs activities, perhaps more inspections off border so you don't wind up with congestion at the border itself.

I would like to supplement these comments with greater detail in a letter.

Mr. COLEMAN. We would be pleased if you would do that.

Mr. COLEMAN. You will be joining a lot of others worrying about problems along the United States Mexico Border. The trucking industry has the same problem with lack of harmonization of requirements for safety, financial responsibility, lots of different issues are there.

I would hope that you would join in this overall discussion as you may have already done, but even more actively with the imposition of a NAFTA agreement. With or without the North American Free Trade Agreement, the reality is that commerce is going on as we speak at unprecedented levels.

Mr. HARPER. That is absolutely correct.

We see it in our statistics or carloads moving North and South across the border.

Mr. COLEMAN. I would appreciate any information you might have in that regard.

TEXAS HIGH-SPEED RAIL VS. AIRLINE

Mr. COLEMAN. Mr. Kelleher, one of the things that I think we all recognized about your airline when it began was that you understood from the outset that you had to move quickly between major cities and better yet to the inner cities, if you could do so.

Do you agree that that is one of the main problems it appears now? It came up when Mr. Wolf asked Mr. Claytor a question about coming in from Dulles.

There is a destination to which you need to get if you are a passenger. For example, not having been a part of the actual debate that went on about the high-speed rail in Texas, at the Texas Legislative sessions, I was curious about what the response was from the high-speed rail folks about how they went from downtown Dallas to downtown Houston, for example?

Mr. KELLEHER. They travel Southwest Airlines when they do that and they fly to inner-city airports which are quite convenient where they want to be. In addition to that, it is quite clear that with respect to the Texas airports and the Texas highways—now I am getting to the issue of need—it is not congested in the air between Love Field, only 40 percent, 50 percent of its capacity is in use and Hobby Airport in Houston.

It is not congested in the air between any of the other cities in Texas that are proposed. It is not congested on the highways. You can set your cruise control at 75 miles an hour once you get out of the cities and never take it off.

Mr. COLEMAN. Sixty-five.

Mr. KELLEHER. I am sorry. I have trouble seeing the figures in my car. But there is no congestion there either. That is one of the reasons that you have the Northeast part of the country where you have a tremendous population density, you have a tremendous demand for transportation services.

Apparently no more new airports are going to be built. You can't build any more highways. It seems to me that that is an appropriate place to do the type of thing Mr. Claytor is talking about.

When you get to Texas there isn't any congestion on the air or on the ground. The high-speed people I think chose Texas because first of all it is flat. That makes it easy.

Secondly, they probably figure that we are suckers for that kind of stuff.

Mr. COLEMAN. It came up at another hearing when we were discussing the issue of Dallas Mass Transit as well as the Houston Metro Rail System, it seemed to me the question came up as a matter of fact from the chairman who asked whether or not any high-speed Metro Rail would be complementary to that. It would have to join those systems so they could get to airports.

As you pointed out, if you had such a system from Houston to San Antonio, many of those people would not achieve their destination of Midland, Odessa, El Paso, Tucson. I suppose there would be no point in taking the rail at all. That becomes a part of the economic difficulty of ridership.

Mr. KELLEHER. Mr. Coleman, you bring up something that I think is very significant in that respect. That is the suburbanization of America.

For instance, high-speed rail says that it will be much more convenient because its stations will be located in downtown Dallas, downtown Houston and downtown San Antonio. Unfortunately for that thesis, unlike France, most of the people that will travel on the rail in the morning and will leave from their homes, not from their offices.

Seventy-two percent of the people coming to Love Field between 7:00 and 9:00 a.m. come from their homes. In order to take the train, they would have to fight their way through rush hour traffic to downtown Dallas in order to take a means of transportation that would take them twice as long and cost them three times as much unless the Federal Government subsidized it.

So I think that is highly unlikely. That is one of the troubles that you have with urban mass transit. It is the urbanization of America. Everybody is not going from one place to another place. They are going across and from one place to five or six different places.

The problem is the same with respect to—this is really inner-city mass transit of a kind.

Mr. COLEMAN. Thank you very much, Mr. Chairman.

Mr. CARR. Thank you.

I think all of the reports that have been published point out that successful high-speed rail both in Europe and Japan and in the Northeast Corridor is in fact dependent on interconnections with other mass transit and that is what makes the Northeast Corridor somewhat more amenable to it than perhaps other areas of the country.

Mr. CLAYTOR. That is correct.

Mr. CARR. When we talk about targeting other rail corridors, we ought to be paying attention to that, shouldn't we?

Mr. CLAYTOR. There are other places, too. Chicago has extraordinarily good transit out to the suburbs. Detroit has had, in the past, a commuter system which has yet stuck, but may come back. That is a possibility.

The Northeast Corridor, New York, Philadelphia, Washington, Baltimore, New Haven and Boston, all do.

TRIP DATA

Mr. CARR. As we know from the aviation experience, the Federal Department of Transportation samples every tenth ticket to get information about where people are and where they are going. To date, however, we have never taken every tenth ticket from Amtrak. This is all supplied electronically.

Shouldn't we be doing that, Mr. Claytor? Shouldn't we begin collecting the data on trips?

Mr. CLAYTOR. Do we have that?

I will ask Mr. Norman to answer that.

Mr. NORMAN. Mr. Carr, we do a demographic sampling of our passengers, but with on-board surveys throughout the entire Amtrak system. We do collect the kind of data, but not electronically.

Mr. CARR. It would seem to me that would be one way to bring these two modes into a common database so that in the Northeast Corridor we could be talking about where people are and where they are going. We get a lot of claims about whether the modes compete and I don't know. We could sit here another hour or two and talk when that is not the purpose of the meeting.

I think maybe we ought to have Amtrak look at the airline systems for supplying data. I know you do all your reservations and ticketing by electronic means. Perhaps the airlines could give you algorithms to make sure Amtrak is brought into this.

As we march down the road of high-speed rail discussion, we get a lot of claims what would happen if this happened? We get a lot of forecasting. I agree with the Transportation Research Board study that said a lot of the forecasting, particularly in the initial stages, tends to be promotional and then later on tends to try to get real.

This Committee is continually bombarded with forecast claims. It would seem to me that when you come back for your fiscal year 1994 request, we could have you think about it.

TURBINE ENGINES

Mr. CARR. I promised I would have Mr. Kelleher talk about turbine engines at least in the aviation experience. Does that shed any light or are they apples and oranges?

Mr. KELLEHER. I am not sure. I wouldn't presume to be judgmental with respect to Mr. Claytor's and Mr. Harper's business and I will endorse the effectiveness and efficiency of the turbine engine, which has remade airline transportation in the United States.

I understand it is being used quite successfully on destroyers now, on the Spruance class destroyers. It gives you instantaneous capabilities, operates for thousands and thousands of hours without need for repair and are getting more and more fuel efficient as time goes on.

The airline industry itself due to improvements in turbine consumption of fuel has achieved a 50 percent increase in consumption efficiency since 1970.

Mr. CARR. Mr. Claytor, the piece that I referred to that was as a result of a request from Senator D'Amato did talk about turbines lacking in terms of maintenance requirements and fuel consumption.

Mr. CLAYTOR. Our experience with the turbines that we have been using so far, is that they have been improving. As a new model comes along, it is improved in fuel efficiency and maintenance over previous ones.

They are still significantly more expensive for us than diesel engines. They are operated under quite different circumstances. They certainly have worked well on our destroyers.

Mr. CARR. Is there a better weight-to-power ratio?

Mr. CLAYTOR. There is, and that is helpful particularly for the high-speed operation. We would like to get the maintenance costs and the fuel cost down more in line with what it is with diesel engines.

Every model that we have had has been an improvement over the previous model.

SOUTHWEST AIRLINES

Mr. CARR. Because this is a hearing that deals with rail, I have a couple of questions for you, Mr. Kelleher, that have nothing to do with rail and I would like to ask them for the record if you would be so kind.

Mr. KELLEHER. Certainly, Mr. Chairman.

They do not concern my personal life, I presume. [Laughter]

Mr. CARR. No. By all accounts, exemplary. They have to do with whether Southwest Airlines has any intention to serve the new Denver Airport and if not, why not? If the reason relates to cost, we would like to know some of that in specifics and also assuming that Stapleton would not be closed, whether you would still intend to serve New Denver.

I don't want an answer on the record here because that is not fair to all those who have spent a lot of time waiting for the high-speed rail testimony. We really appreciate all you gentlemen being here. I, speaking for the committee, can say we have learned a lot.

Mr. KELLEHER. Thank you for the opportunity to appear. We greatly appreciate it.

MONDAY, MARCH 15, 1993.

GENERAL ACCOUNTING OFFICE

WITNESSES

KENNETH M. MEAD, DIRECTOR, TRANSPORTATION ISSUES, RESOURCES, COMMUNITY AND ECONOMIC DEVELOPMENT DIVISION, GAO

DR. FRANK MULVEY

STATEMENT OF KEN MEAD

Mr. CARR. Our next panel of witnesses: Mr. Ken Mead, Director of Transportation Issues for the U.S. General Accounting Office. He is well known to us and helps us out in all the modal studies. Mr. Joseph Vranich, President of the High-speed Rail/Maglev Association. And I should announce that Mr. Larry Salci of the Texas TGV Corporation has previously been scheduled to attend, but due to weather considerations in the Washington, D.C. area, has asked to be excused. We do so gladly and hope maybe at a later date we can hear his testimony.

Mr. Mead, why don't you identify your associate for the record, another friend of the committee, and then you proceed first.

Mr. MEAD. Thank you Mr. Chairman. This is Dr. Frank Mulvey. He directs our work in the high-speed rail area. He is a longtime student of Amtrak. I've got a prepared statement, Mr. Chairman, and I will simply submit that for the record and will go through the oral version as quickly as possible.

Mr. CARR. It will be included for the record.

Mr. MEAD. We have a fairly straightforward set of messages for the committee today. I think it's useful to first set a frame of reference. I was struck by what Mr. Wolf said earlier in that you need a frame of reference because of the different types of high-speed rail. There are several approaches, and not surprisingly the ones that allow the highest speeds generally carry the highest price tag as well.

The incremental approach, which is what Mr. Claytor was speaking of, uses existing rights of way in combination with technologies like the X2000, and gets you to speeds somewhere between 125 and 150 mph at a cost of about $2 to $10 million per mile or up to $2 billion for a hypothetical 200 mile system.

That approach largely avoids the need to acquire new rights of way but it requires cooperation from the freight railroads because they own the tracks in most instances outside the Northeast Corridor. The second tier is a TGV type technology that could achieve speeds of between 150 and 200 MPH, but that requires a new, dedicated, and reasonably straight right of way. The cost here is a little more, $10 to $20 million per mile, or up to $4 billion for a hypothetical 200 mile system.

That's in the neighborhood of the price tag on the new Denver airport, if I recall correctly. The advanced automation system would also cost about $4 billion too, Mr. Chairman.

Going up to the top tier, the maglev system allows speeds between 200 and 300 miles per hour. In addition to rights of way, they require expensive new guideways, which further raises the cost to between $20 and $60 million per mile or up to about $12 billion for the same 200 mile hypothetical system.
system.

We noted last year, in a report on these issues, securing the rights of way for either TGV or maglev technology can be a time consuming process.

A number of systems have been proposed as shown on this next map. This map is already out of date, Mr. Chairman. But this one will do because, as you know, none of these systems have been constructed. These are mostly planned or proposed systems.

None of them have really gone beyond the planning stage to address another question that Mr. Wolf had earlier. The financial community perceives them as too risky. I'd like to spend a few moments on that particular point because that's where we have done a fair amount of our work. We have met with senior representatives at a number of the major investment houses of this country and they were virtually unanimous in their view that no high-speed ground transport systems will be built in this country without a greatly increased Federal financial commitment.

And that commitment, in their view, will be an absolute necessity to cover the risk exposure and uncertainties about the timing and extent of the return on investment of any consequential private venture.

There are three key risk areas. First there is the lack of U.S. experience with high-speed ground transportation. There is virtually no revenue service experience anywhere in the world in the case of magnetic levitation. You have heard about test tracks in Germany and in Japan, but it is not in revenue service there.

And most analysts believe that at least in the near term, revenues will not come close to covering the capital costs.

A second key risk area is the large scale of these projects. Large projects like these present a greater likelihood of delays and cost overruns, especially when you are dealing with a new technology. Private investors want their investment to produce a return by a date certain. This is one of the big risk factors also at the new Denver airport. That is why the opening date is such a critical one because the bonds come due on that date and the people who have purchased them expect to be repaid.

The third area of risk stems from potential delays in the permitting process. Many jurisdictions at different levels of government will be involved in issuing permits, not just at the State level. It will be local jurisdictions as well, particularly if you are talking about 200 or 400 mile routes. Obtaining those clearances is going to consume some time.

On the Anaheim-Las Vegas maglev proposal they ran into some problems with the Endangered Species Act. I believe it was a turtle.

Mr. **Mulvey**. The Mojave Ground tortoise, I believe.

Mr. **Mead**. These are the different strategies that the investment houses have suggested for what might be required from the Federal and State governments.

The first, of course, is providing equity capital, which would be particularly important during the early, risky phases of the project. Another type is the traditional loan guarantees which could induce private investment. You may recall the Title XI maritime program that experienced difficulties a few years ago.

Another mechanism is removing the cap on tax exempt high-speed ground transportation bonds. There is a cap. Perhaps you have heard, on a private bond activity for high-speed rail projects. There is a proposal—I don't know if it has been introduced in the House but it has in the Senate, that would put high-speed rail on the same footing as the seaports and airports. Right now seaports and airports can issue bonds, but not high-speed rail.

The Infrastructure Investment Commission recently recommended establishing a direct revolving loan fund. Value capture is another financing technique. That technique relies on the use of the expected increase in property values surrounding a project as a way of getting financial advances.

I would not look, Mr. Chairman, to any one mechanism as a panacea for funding. Because of the large size of these projects and the risks involved, you are very likely to need a combination of these different strategies.

I would like to close on a couple of notes that deal with the benefits side of the equation here. You asked Mr. Claytor whether it would be a good idea to collect the same type of data concerning ridership that the airlines do. I think it would be a good idea.

A big reason that the investment community is not particularly excited about high-speed ground transportation is that they are not convinced that the forecasts of ridership and success are good predictions. And the data underlying these forecasts as well as the Federal Government's contributions to this has not been very good. And I think that the suggestion you made to Mr. Claytor was a very good one. And I think also the Department's Bureau of Transportation Statistics mandated by the ISTEA legislation could contribute a lot in that regard.

A second suggestion you made, Mr. Chairman, dealt with where should we target our resources and you asked if Mr. Claytor could come up with some recommendations. I also think that targeting resources is a good idea because as that map was suggesting, there is no way that we will be able to target Federal dollars to all of those projects. Where do we stand right now in terms of Federal dollars?

Well, most of the money so far has been spent in the Northeast Corridor, where $2.5 billion has already been spent. We have about $1.35 billion to go just in the Northeast corridor. There has been some planning money but not much. ISTEA authorized $30 million over a five-year period for reducing grade crossing hazards. This relates to the $5 million per year that you spoke of. ISTEA authorized $725 million for a maglev prototype development. That was not appropriated.

The Clinton administration's vision report proposes $646 million for high-speed ground transportation. There are various reports of whether that is additive to the $725 or in substitution for it. We have examined the documents that are available and we come away uncertain on that particular point.

Thank you, much.

Mr. Carr. Thank you, Mr. Mead.

[The prepared statement of Mr. Mead follows:]

United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Transportation,
Committee on Appropriations
U.S. House of Representatives

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HIGH SPEED GROUND TRANSPORTATION

Financial Barriers to Development

Statement of Kenneth M. Mead
Director, Transportation Issues
Resources, Community, and Economic
Development Division

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to testify on the issues surrounding the introduction of high-speed ground transportation (HSGT) in the United States. Our work to date on HSGT is based on meetings and discussions with members of the financial community with experience in financing these types of projects, Amtrak and other railroad officials, HSGT project planners, and other transportation analysts. We have analyzed the available data on the progress of HSGT both in the United States and abroad, and to gain some first-hand experience, we have ridden on several of the new systems, including the Swedish X2000 train. Our work is being done in response to interests expressed by both the Senate and House Appropriations Committees and the House Committee on Energy and Commerce.

By high speed we refer to systems capable of sustained speeds of at least 125 mph.[1] Advanced high-speed rail systems, such as the French TGV and the Japanese Shinkansen, have carried millions of passengers over the years at speeds between 130 and 185 mph, and magnetic levitation (maglev) technology is being developed in Germany and Japan that could carry passengers safely and efficiently at speeds over 250 miles per hour. Progress toward increased speeds in the United States has been limited to incremental improvements to existing Amtrak routes, especially in the Northeast Corridor, where Amtrak's Metroliner trains achieve 125 mph speeds over some stretches between Washington and New York. (See fig.1).

Policy choices with significant financial impacts will have to be made before HSGT is developed in the United States. High speed systems, like those of Europe and Japan, will be very expensive to build and no organization, thus far, has been willing to bear the risk of investing in HSGT in America.

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[1] In the United States, most Amtrak trains travel at speeds below 79 mph, and often average only 50 to 60 mph.

Our basic points are as follows:

-- The United States could pursue several levels of technological improvements to make HSGT a reality here. Each higher level of improvement would result in greater speed, but only at a greater cost. Generally, incremental approaches that build on the existing rail infrastructure would allow increased speeds of up to 150 mph and would incur the lowest capital cost. Amtrak has used this strategy in the Northeast Corridor. More advanced approaches, such as the French TGV or maglev, are much more costly and are perceived as being more risky by potential investors. Because these systems are untried in the U.S. environment, there is uncertainty about whether they could generate revenues sufficient to cover operating costs, repay lenders, and produce an acceptable return on investment.

-- In addition to Amtrak's efforts, more than a dozen HSGT projects have been proposed around the nation, but none has obtained private funds to begin construction and federal support has been minimal. These proposals have tried, unsuccessfully, to rely largely on private capital to fund system construction, but our review shows that it is unlikely that any major HSGT projects will be built if developers must rely primarily on private capital. Until HSGT systems are proven to be successful in the United States or until the public sector decides that there are sufficient public benefits to justify underwriting some of the risk, private financing sufficient to launch a major HSGT project will not be forthcoming.

-- According to the investment community, if HSGT systems are to be built in the United States, increased federal leadership and financial commitment will be necessary. To date, federal involvement has concentrated on underwriting Amtrak's program to bring about incremental improvements in the Northeast Corridor and to authorize funds for further research on HSGT. The financial community believes that federal commitment, especially through substantial financial assistance for the initial HSGT systems, is necessary to leverage significant amounts of capital from the private sector and to help establish public-private partnerships to develop additional HSGT systems.

-- Both private and public investors require realistic forecasts of potential ridership. Private investors need the data to project expected returns on investment. The public sector requires better data to judge the appropriate commitment of public resources. The federal commitment to HSGT must be proportional to the expected net social benefits, such as congestion relief and reduced pollution, that could result from investment in HSGT. Accurate estimates of the size of these benefits also depends on reliable forecasts of ridership. However, some data, especially for auto travel, are lacking and without these data accurate estimation of system use and social benefits is problematic. In addition, many social benefits are not easy to monetarize making it difficult to compare benefits with costs. While the data can never be perfect, there is room for considerable improvement. Given the size of the investments at stake, the data bases and benefit estimates should be improved.

I would like to turn to a more detailed discussion of these points.

QUESTIONS TO BE ADDRESSED BEFORE INCREASED COMMITMENT TO HSGT

Federal participation in developing HSGT in the United States depends on the answers to some basic questions: who? what? where? and why? Who will elect to ride such systems (and how much will they pay)? What kind of system should we build--rail or maglev? Where should such systems be built--in densely traveled corridors or between airports? Why should the federal government be involved--what are the social benefits from such systems? These questions are not easy to answer, and they are interrelated. Where we choose to build a system will help determine what type of system we should build. Who chooses to ride the system can help answer what public benefits might accrue. There is one other question, however, for which we do have at least a qualitative answer, and that is how much will it cost to bring HSGT to America? Quite a bit; the exact amounts depend on which technologies are chosen.

PERFORMANCE AND COSTS VARY FOR DIFFERENT HSGT TECHNOLOGIES

Each of the technology options performs differently and carries a different price tag. Not surprisingly, the cost of these options increases as the design speed increases. According to a recent estimate, the capital costs of achieving high speed operations for a hypothetical 200-mile-long system ranges from $500 million for incremental improvements to existing tracks that could bring speeds up to 110 mph to more than $12 billion for a maglev system that might allow speeds of more than 200 mph. (See fig. 2.)

The lower cost option would achieve higher speeds by improving the existing track, roadbed, and signal systems, and eliminating grade crossings. According to the National Research Council, the cost to upgrade an existing rail line to allow speeds of about 110 mph would be about $2.7 million per mile.[2] Although not quite "high-speed" as we have defined it, this would represent a significant improvement over current conditions. Speeds on most Amtrak routes are restricted to below 79 mph, and on some sections of track, considerably below 79 mph. To achieve speeds of up to 150 mph while continuing to use existing rail infrastructure would require electrification of the rights-of-way and construction of additional track to permit high-speed passenger trains to pass slower freight and commuter trains. The capital cost to achieve speeds approaching 150 mph could range up to $10 million per mile.

Progress So Far Limited to Incremental Improvements in Northeast Corridor

To date, most of the improvements in rail operating speeds have been in the Northeast Corridor. Metroliner trains travel over electrified rights-of-way between Washington and New York at speeds up to 125 mph. North of New Haven, Amtrak must use diesel locomotives and speeds are further reduced due to the numerous curves between New Haven and Boston. Amtrak is currently experimenting with the Swedish X2000 tilt train. Tilt trains can traverse curves at higher speeds and, if adopted, can help shorten trip times significantly between New York and Boston after Amtrak completes its electrification of that part of the corridor. The X2000, or similar equipment, is a part of an "incremental" approach to attaining higher speeds, and it is such incremental improvements that Amtrak plans for other corridors around the nation. By using technologies like the X2000 and continuing to eliminate grade crossings, improve signalling, and make other improvements Amtrak hopes to be able to offer 150 mph service in the Northeast Corridor by the end of the century.

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[2] Transportation Research Board, Special Report 233: In Pursuit of Speed-New Options for Intercity Passenger Transport (Washington: National Research Council, 1991).

The only major segment of the U.S. rail network owned by Amtrak is the Northeast Corridor. Outside of the Corridor, the railroad network is owned by freight railroad companies. Amtrak recently reached an agreement with the nation's freight railroads over the issue of liability for accidents on freight railroad-owned tracks where high-speed trains would share the track with freight trains. The agreement recognized the need to protect freight railroads from the consequences of accidents involving high-speed passenger trains, but does not remove the numerous logistical obstacles to operating freight and high-speed trains on the same track. Assuming that high-speed passenger service would be relatively frequent, there would be serious interruptions to freight operations. In the Northeast Corridor, some freight traffic is limited to night operations to accommodate passenger trains that operate over the same track during the day. Other costs, such as those for maintaining rights-of-way, will be higher if heavier freight trains share the track with high-speed passenger trains. Regardless of who bears the added costs from joint operation, the nation's privately owned freight railroads will, understandably, examine the impact on their operations before acquiescing to high-speed passenger trains over their tracks.

High-Speed Systems Beyond Incremental Improvements Will Be Expensive to Build

Proposals to go beyond incremental improvements have been advanced by groups other than Amtrak. While Amtrak is often viewed as a potential operator of these systems once built, it has been independent state and regional interests that have advanced HSGT thus far. For HSGT service over 150 mph, new track, new rights-of-way, or entirely new guideways will be required. The French TGV, for example, operates mostly over a dedicated right-of-way and achieves speeds above 180 mph. These types of systems reduce rail travel times so much that they might be competitive with air travel for many trips shorter than 400 miles. Both the French and the

Japanese recorded substantial traffic shifts from air to rail following the introduction of high-speed rail systems.[3] The National Research Council estimated that capital costs for a TGV-type system could exceed $3.5 billion for a 200-mile system, or more than $17 million per mile. Alternatively, lanes could be added to expand capacity of interstate highways. Additional lanes would serve multiple users not just intercity travelers--although not at such high speeds. However, there are problems with widening highway rights-of-way that could frustrate such efforts to expand capacity. In some places where congestion is greatest, the highway is already bounded by development making expansion impossible without acquiring more land--often an expensive proposition.

A maglev system could allow even faster speeds, but also would require an entirely new guideway infrastructure, making maglev more costly than all high-speed rail alternatives. Although successfully tested at 320 mph in Japan and 270 mph in Germany, no high-speed maglev system has ever been placed in revenue service. In fact, the Germans have not chosen to introduce maglev on major routes, but have proceeded, instead, to introduce a new high-speed train that uses conventional railway track--the Intercity Express or ICE trains. A maglev system could cost between $20 million and $60 million per mile. The National Research Council estimated a cost of $6.4 billion for a 200-mile maglev system, or about $32 million per mile. Some advocates of maglev believe that it is the coming technology and that only maglev can offer Americans such a dramatic improvement in speed and service that they will switch to HSGT in large numbers. Other supporters believe that if the United

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[3] European nations and Japan have historically followed policies that favor rail over air and auto travel for intra-national trips. Air fares are much higher and investment in the highway systems came later than in the United States; so rail has preserved a higher market share than in the United States even in markets not served by high-speed trains. Nevertheless, the rail share increased significantly in French and Japanese markets after high-speed service was introduced.

States chose to develop its own version of maglev, the investment could generate new jobs and develop a new high-tech industry. Still, the cost of building a 200-mile system to serve one route could be twice as high as the $3.1 billion it cost to build the new Denver Airport, and while the maglev route serves only one corridor, the new Denver Airport connects Denver directly to hundreds of cities around the nation and the world. Like highways, however, airports face serious restrictions on new construction and expansion.

Any HSGT systems that operate at speeds over 150 mph require dedicated rights-of-way.[4] Therefore, a major part of the cost of such a system will be right-of-way acquisition. As reported last year in our study of HSGT right-of-way issues, both high-speed rail and maglev systems will require new, relatively straight, and level rights-of-way compared with existing rail rights-of-way to eliminate safety and passenger discomfort problems.[5]

Operating and maintenance (O&M) costs of HSGT systems are also likely to be high, relative to those for conventional rail for several reasons. Track and guideways must be maintained to very high standards, and safe operation of HSGT requires expensive signal and control systems. One analysis reported that track maintenance costs are 5 times higher for 125 mph trains than for trains traveling 60 mph. The O&M cost per train mile for a maglev system has been estimated to be about 20 percent higher than that for a high-speed rail system. However, as there is no U.S. experience with operating HSGT systems, O&M costs in the U.S.

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[4] In urban areas, where new rights-of-way are difficult to obtain, rights-of-way would likely be shared with conventional rail traffic and speeds would be significantly reduced.

[5] High-Speed Ground Transport: Acquiring Rights-of-way for Maglev Systems Requires a Flexible Approach (GAO/RCED-92-82, Feb. 10, 1992).

operating environment can only be roughly estimated until a system is actually put in operation.

PRIVATE FINANCIAL COMMUNITY VIEWS HSGT AS A RISKY INVESTMENT

A general unwillingness to commit private and public financial resources to American HSGT projects is the principal reason why no such projects have progressed beyond the planning stage. On the basis of the projects and analyses that we reviewed and on discussions with members of the financial community who have experience with major infrastructure investment projects, we believe that unless the federal government underwrites a large part of the risk and assumes a larger role in HSGT financing, these projects are unlikely to be built. HSGT development will require a long-term commitment of capital and resources. Because there is little assurance that these systems can earn a positive return on invested capital, they are considered to be very risky investments by private investors.

Private investors will review HSGT projects to determine if the potential returns on investment are commensurate with the level of risk. According to some analysts, equity investors require expected rates of return as high as 30 percent when investing in high-risk ventures. Interest rates that bond purchasers will require depend upon the likelihood that the system will generate revenues to pay the interest and repay principal. Moreover, while the discussion below focuses on the risks to private investors, there are also risks associated with public investments. Ridership and revenues may be less than projected leading to larger operating subsidies and to fewer social benefits. Public funds that could have gone for other projects or to deficit reduction would be lost.

Members of the financial community described a number of risks that illustrate why private investors are unwilling to go it alone on HSGT projects. First, because of the lack of experience in the United States with HSGT, ridership and revenue forecasts may be exaggerated. The financial community typically discounts demand forecasts for demand-sensitive start-up projects, like toll roads and, presumably, HSGT projects. Furthermore, projects are usually expected to generate revenues sufficient to more than cover their debt service needs. For some projects, these "coverage factors" can be as high as 150 percent of actual debt service needs or greater. These relatively high levels of coverage are desirable because they can offset various uncontrollable events that could reduce revenues. Unless the financial community believes that HSGT projects can generate enough revenues to both cover debt service and provide a return on investment commensurate with the risks, it is unlikely that private capital will be forthcoming.

Financial analysts with whom we spoke agree that in the near term most HSGT projects will not generate enough revenues from their operations to pay off their capital debt, making such projects unattractive to debt investors. Moreover, developing technologies, such as tiltrotor and teleconferencing, may compete favorably with all forms of transportation including HSGT.

Second, the large scale of proposed HSGT projects adds to the risk. The larger the project, especially when new technologies are being introduced, the greater the likelihood that construction delays and cost overruns will undermine the financial feasibility of the project. Generally, projects that issue debt to raise capital will need to begin repaying the debt by a specific date. A concern of potential lenders is that unless adequate revenues or other cash are available on that date, the project could go into default. Furthermore, system start-up delays cause interest to accrue on outstanding debt.

Third, large-scale projects like HSGT systems face a number of political risks, in part, because many jurisdictions at different levels of government will be involved in issuing the permits and other clearances needed to build and operate the system. In our review of the problems associated with acquiring rights-of-way for HSGT projects, we uncovered numerous constraints. For example, the proposed maglev route between Anaheim and Las Vegas would face scrutiny by the Bureau of Land Management because of possible disruption of the habitat of several endangered species.

Obtaining either equity or debt financing from private investors may prove problematic for developers of HSGT projects. Investments of equity in a project are often needed before commercial lines of credit can be obtained or investment-grade debt can be issued. However, equity investors often demand high rates of return and a relatively quick payback. Because HSGT projects will have lengthy development and construction periods, it will be difficult to provide the timely payback that equity investors want. Therefore, HSGT developers may find it difficult to obtain private equity for capital purposes. By contrast, bond buyers are generally interested in a secure investment with a guaranteed return overtime. Debt instruments are typically rated on the probability that they can be paid off by project revenues. Since most analyses of HSGT projects conclude that revenues are unlikely to cover capital costs, investors would not buy these bonds unless offered prohibitively high interest rates.

FEDERAL COMMITMENT TO HSGT NEEDED TO ENCOURAGE PRIVATE INVESTMENT

In light of the previously described difficulties, members of the financial community familiar with large-scale projects told us that unless the federal government assumes a major role in HSGT development, thereby reducing the perceived investment risks, private capital generally will not be available. Government involvement in financing could take a number of forms such as providing early financial and administrative assistance early stage, providing loan guarantees, exempting interest income from taxation, establishing revolving loan funds, and participating in value capture strategies. However, any federal financial involvement would need to be evaluated to determine its budget and deficit impacts. If the federal government concludes that a greater commitment to HSGT is warranted, it could help lower the risk to private investors in several ways.

SEVERAL STRATEGIES COULD BE PURSUED BY THE FEDERAL GOVERNMENT TO REDUCE THE RISKINESS OF INVESTMENTS IN HSGT

The federal government could provide financial and administrative assistance during the initial development and construction phase of HSGT projects. The early stages of a project are typically a high-risk period for new infrastructure projects because many time-consuming regulatory and financial obstacles must be overcome. Further, several analysts suggested that the federal government is the entity best suited to be the principal provider of equity capital during the early phase of a HSGT project. Private financial markets want the project to have equity in it before lines of credit or other private assistance will be extended. The federal government could also provide financial assistance through loan guarantees and tax exemptions.

Provide Loan Guarantees. The federal government could become a guarantor for different components of a project. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) made HSGT eligible for loan guarantees authorized by the Railroad Revitalization and Regulatory Reform Act of 1976. However, no appropriations have been made for HSGT projects. According to HSGT proponents, contingent loan guarantees such as these could induce private debt and equity investments in HSGT. Similarly, the federal government could become a guarantor of revenues for HSGT projects. Such guarantees could be particularly helpful during the first few years of operations, giving the system time to build up ridership and revenues. Again, with such guarantees behind the project, a HSGT developer's ability to secure private financing would likely be enhanced.

Extend Tax-Exempt Status. The Congress could extend tax exempt status to debt issued to build HSGT systems. HSGT proponents believe that tax-exempt status is critical if these systems are to be built. Tax-exempt bonds are an attractive mechanism for raising capital because bond issuers pay a lower interest rate than on taxable debt, thereby lowering the total cost of capital. While the current tax code does not restrict the amount of private activity, tax-exempt bonds issued for airports and waterways, it restricts tax-exempt bond issues for high-speed rail. The limitation on these bonds was imposed in 1986 in response to a proliferation of such bonds for private, profit-oriented projects, and the resultant loss of revenue to the federal government. However, some financial community representatives believe that HSGT, even if developed and operated as a private venture, would clearly serve a public purpose. The Congress last year considered but did not enact legislation to remove this restriction for HSGT. The Congress has introduced legislation to remove the restriction on using tax-exempt bonds to finance HSGT development. However, the benefits to HSGT will need to be weighed against the potential impact on the federal deficit as well as against other initiatives that may also seek to receive favorable tax treatment.

Create a Revolving Loan Program. Direct loans, through a revolving loan program, is another option for a federal role in HSGT development. Some members of the financial community, as well as the Infrastructure Investment Commission, have suggested that the federal government should establish its own revolving loan fund for infrastructure development or help fund state-level funds for the same purpose. To capitalize such a fund would require a large initial appropriation or several smaller appropriations over the span of several years. HSGT projects, however, are likely to be so large that only a portion of their financing needs could come from such a fund, particularly since HSGT will have to compete with other infrastructure projects. However, loans from such a fund would presumably carry below-market interest rates. Thus, they could help lower the cost of capital for HSGT and enhance their financial feasibility.

Use Value-Capture to Fund Parts of Projects. Finally, value capture is a way for other government entities to assist the development of HSGT. Under a typical value capture strategy, a local or state government would provide funding for components of a HSGT system, such as a station, in anticipation that property values would increase in the vicinity of the HSGT property after the system is in place. Rising property values could generate increased tax receipts or other assessments which could offset the state's initial expenditure. In this sense, the HSGT system "captures" the benefits of higher future property values, and uses them as a source of funds. In the past, value-capture strategies have been used successfully to provide revenues for several urban transit systems. An innovative value-capture-type financing strategy was used in California, where a new publicly administered but mostly privately financed toll road has imposed fees on new construction in the areas that will presumably benefit from the toll road. These fees will be used to help leverage private capital investments to build the road.

For HSGT, however, value capture could be used to finance specific components of a system, but could not be the major funding source. The plan to build the Tampa-Orlando-Miami HSGT system initially relied on a strategy similar to value capture as the major source of finance, but found that it would not generate sufficient funds and has since revised its financial strategy. Furthermore, it may take several years to generate any revenue from value-capture strategies, since land value increases and development around a HSGT system might not occur until the system's construction or operation is well underway.

It seems likely that some combination of these options would be necessary to bring a HSGT project from concept to reality. Different financing methods could be used at different "risk points" during a project's development period. For example, the Texas HSR Corporation plans to use different financing techniques in various phases of its plan to bring TGV-style service to the "Texas Triangle" cities of Dallas, Houston and San Antonio. The plan includes using initial equity contributions, tax-exempt debt backed by long-term letters of credit, and after operations and revenues become steady, a public stock offering.[6] Such a combination of approaches spreads, and therefore minimizes, risk over time and across investors and creditors, thereby making investment in such a project more plausible.

Regardless of how creative high-speed rail developers are with their financing plans, it seems apparent that the private sector alone will not assume all, or even a substantial share, of the risks associated with HSGT development financing. Many states and localities are experiencing financial difficulties, with little, if any, funding resources available for financing high-risk, large-scale infrastructure projects. While the federal government is also faced with making difficult spending choices, it is the only entity capable of underwriting the sizeable risks associated with HSGT projects. Therefore, if such projects were to be built in this country, the federal government would need to assume a major role in financing HSGT.

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[6] The system was originally scheduled to begin service in 1998. Obstacles, including financial ones, have caused the schedule to slip and the start up date is now uncertain.

ACTUAL AND PLANNED FEDERAL FUNDING

The federal government has provided assistance to improve speeds on the Northeast Corridor, to study specific HSGT corridors, and to develop HSGT safety regulations. Since 1976, Amtrak has spent about $2 billion of appropriated funds and expects to spend an additional $1.5 billion to complete improvements between New York and Boston. Amtrak expects that these improvements will allow 150 mph speeds by the year 2000. In addition, in fiscal years 1991 and 1992, the Congress appropriated $3 million for studies of specific HSGT corridors, contingent on matching funds. The Federal Railroad Administration (FRA) also has used some of its research and development funds to develop safety regulations for HSGT systems.

For maglev, the federal government has sponsored the National Maglev Initiative (NMI), which is a 3-year study to assess the potential role of maglev in the United States. According to FRA officials, funding for NMI has totaled $36 million. The NMI report is due in the Spring of this year. In 1991, as part of the ISTEA, the Congress authorized $725 million for a National Maglev Prototype Development Program, but this program did not receive appropriated funds for fiscal year 1993.

President Clinton often offered HSGT as an example of the kind of infrastructure spending that the nation should be making. The new administration has now proposed outlays of $646 million between 1994 and 1997 for HSGT. It is unclear whether this $646 million is intended to be an addition to the $725 million already authorized under ISTEA, but not appropriated. Whether the increase in outlays will be sufficient to encourage private investment activity is uncertain, given the cost of these projects.

FEDERAL GOVERNMENT NEEDS TO WEIGH CAREFULLY THE BENEFITS AND COSTS OF HSGT BEFORE MAKING MAJOR RESOURCE COMMITMENT

Federal resources are scarce and becoming increasingly so. At a time of national belt-tightening, all new projects must be given careful scrutiny to ensure that they are cost-effective. If the federal government decides to invest in HSGT, it will need to be certain that such investments are cost-effective over the long term--that is, that investing in HSGT is an efficient way to capture desirable social benefits.

To determine the amount of federal resources that might be committed to developing HSGT in the United States, the Congress and the Clinton administration need good data to determine what social benefits might result from such systems. But, the data often do not exist or can not help determine whether HSGT is the best way to achieve these benefits. Further, HSGT must be evaluated in comparison to alternative approaches. Airport congestion could be relieved by building HSGT or it could be relieved by adding another runway. Air pollution emissions could be reduced by diverting auto traffic from congested highways onto HSGT or stricter emissions standards could be adopted.

To determine the relative cost-effectiveness of HSGT, better estimates of potential demand are needed, but there are gaps in the necessary data. The data are either too aggregated or do not exist at all. For example, diverting auto traffic can be an important source of public benefits, but there are virtually no data on intercity auto travel that could be useful for forecasting demand for HSGT. In addition, there are problems with translating social benefits into comparable monetary terms. For example, how much is it worth to remove a ton of automobile-generated air pollution? How does the fact that the reductions occur over a widespread, often non-urbanized area affect the estimates of the benefit? How reliable are the estimates of the relationships between emissions and health costs? How much, if anything, beyond the current market price of energy is reduced reliance on foreign petroleum worth?

While there are many problems with calculating the potential social benefits from investing in HSGT systems, the federal government could consider investing in developing better data on which to base demand forecasts for HSGT. Although data collection can be costly, the cost will be relatively insignificant compared with the potential cost of a HSGT system. Gaining improved prior information on the likely success of an investment in HSGT seems to be the prudent course of action.

CONCLUSION

The decision to increase spending for HSGT is an important one that must be made at a time when efforts to pare down the size of the federal deficit are making discretionary dollars increasingly scarce. Yet, without an increased federal commitment, HSGT will not advance in the United States.

If the Congress decides to increase the federal role in developing HSGT, the Congress will need to balance the resources it provides between continued support for incremental improvements by Amtrak and underwriting the risks of more ambitious projects through forging public-private partnerships. The Congress will also need to decide where to target the resources it makes available for specific HSGT projects. This will require a fuller understanding of the benefits and costs of individual HSGT projects, and gaining that understanding requires, in turn, reasonably reliable data. Better information will help the Congress as it sets priorities for the future of HSGT in America.

Mr. Chairman, that concludes our testimony. We would be happy to respond to any questions you might have.

Figure 1: Relative Top Speeds of High Speed Ground Transportation Systems

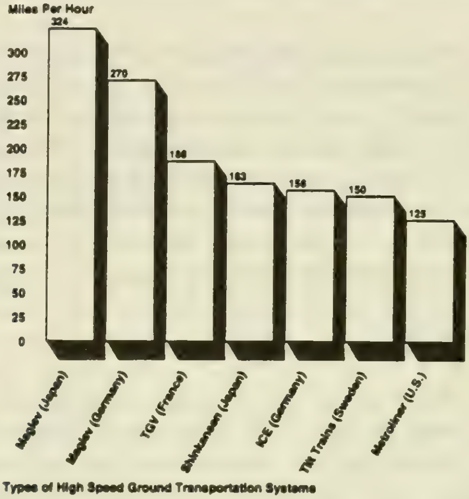
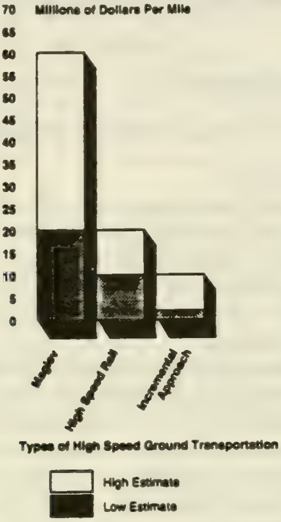


Figure 2: Relative Costs of High Speed Ground Transportation



MONDAY, MARCH 15, 1993.

HIGH SPEED RAIL/MAGLEV ASSOCIATION

WITNESS

JOSEPH VRANICH, PRESIDENT

STATEMENT OF MR. VRANICH

Mr. CARR. Mr. Vranich.

Mr. VRANICH. Mr. Chairman, Mr. Wolf, on behalf of the High-speed Rail and Maglev Association, I thank you for the opportunity to appear here today. I represent an association that has a very diverse membership. We're a coalition with broad support much more widespread than is known a trade group. I often recommend that we change our name.

I am in full support for incremental improvements to Amtrak. We have been a long-time booster of the Northeast Corridor program. We were I think the first organization to support the ISTEA provision for incremental improvements to Amtrak that resulted in the later designations of routes like Chicago-Detroit, and Washington-Richmond down to Charlotte, North Carolina, and a full supporter of grade crossing elimination.

I like to say that even if we didn't have high-speed rail on the horizon, we ought to be eliminating and conducting more improvements at our grade crossings anyway. We suffer 500 motorist fatalities at our grade crossings and we need to address that. Public and private partnerships have been trying to lead the way on high-speed systems.

The interest continues to grow because of new successful services operating in France, Spain, Germany, Sweden, Italy, and Japan and proposed elsewhere. The growth in transportation will be so significant that the United States may spend as much as $3 trillion on our transportation infrastructure by the year 2010.

So the question becomes not will we finance transportation infrastructure and additional runways and highways and rail lines and so forth but what mixture of modes will there be and how we will finance it all.

With that in mind, we propose to stimulate private sector and State and local initiatives through diversion of defense funding, tax exempt bond financing as a provided to airports, the guaranteed obligations program, and investment tax credits.

Additionally, financing of Amtrak's Northeast Corridor line is justified—that is the line that is already owned by the taxpayers and I think it ought to be upgraded further. It should be noted I recommended only those programs that already exist for aviation. Programs that I became familiar with during my career in the aviation and aerospace business.

We need to start building the right kind of infrastructure in the right places. I may be known as an high-speed rail advocate but I'm an intermodal advocate. I argue for new airports but new airports alone can't solve our problems, our business is moving people. We must include high-speed rail transportation in our planning. Several airlines are leaders in this field. Alitalia Airlines and

Lufthansa operate trains out of their Rome and Frankfurt hubs. Lufthansa is looking to expand train departures from 8 per day to 42 per day. Swissair and Swiss Rail have integrated services at the Zurich and Geneva airports. Virgin Atlantic Airways is seeking to begin service between Edinburgh and London.

Pierre Jeanniot, chief executive officer of the International Air Transport Association said, and I quote, "I am generally in favor of the high-speed train. I do not perceive the high-speed train as a rival of the plane but more of a complement to our north American environment." And.

Air Canada is studying the Montreal-Toronto route maybe going over to Windsor. I indicated to an Air Canada marketing planner if you are going to go that far, why don't you look across the river and talk about extending the line to Detroit. Ed Colodny has endorsed the high-speed rail idea. In the March 8 edition of Maglev News, a new publication, John Bowen reported that USAir is planning to help fund the Pittsburgh high-speed maglev project. USAir's willingness to submit funds is significant giving their current financial stress.

James Tyler of Federal Express said there is a serious need for alternate kinds of transportation such as high-speed rail. It can offer advantages that aircraft, by their very nature, can never be able to match. Not the least of these are all-weather reliability and enroute sorting of packages which gave me a chuckle because we used to do that in the postal service.

Aviation suppliers like Grumman and Hughes Aircraft are now members of this association and airport executives in Miami, Orlando, Pittsburgh, Los Angeles, and New York are seeking such services into their facilities.

The creation of high-speed rail systems can stimulate the economy, while bringing about environmentally benign systems. Such trains can help save energy, reduce air pollution, and reduce the amount of land required for infrastructure. They also are the safest form of transportation ever devised.

The high-speed trains of Japan have operated for 28 years and TGVs in France for more than a decade. Together they have carried almost 3.5 billion passengers and there has never been one passenger's life lost. The political interest continues to expand. It's been there for a long time at the local and State level. I always like to remind people that as the Persian Gulf war ended, Senate Majority Leader, George Mitchell asked if we could build a high-speed patriot missile, can't we build a high-speed train?

More than ever today the answer is yes, we can. Several questions have been asked about ridership studies. I would like to offer for the committee's consideration, of course it's your call whether you want to include this in the record, a document prepared by the association. We readily admit that ridership studies have been the source of controversies over the years and a number of years ago put together a very, very tough document called *Standard Guidelines for Revenue and Ridership Forecasting,* which I would like to give you for your review.

The purpose of this was to allow the planners to present investment grade ridership studies to Wall Street. The bottom line, if a study is done according to these guidelines, it is accepted on Wall

Street much more readily than if it is done not in accordance with these guidelines.

Thank you for your attention. I would be pleased to answer any question that you may have.

Mr. Carr. Thank you very much.

[The prepared statement of Mr. Vranich follows:]

Statement of Joseph Vranich
High Speed Rail/Maglev Association

Mr. Chairman and members of this distinguished Committee, on behalf of the High Speed Rail/Maglev Association, I thank you for the opportunity to appear here today.

I represent an Association that has a diverse membership active in high-speed rail.[1] We are an "umbrella group" with broad support -- more widespread than typically found in a trade group -- because we include a variety of interests. Active are engineering firms, railway suppliers, electric utilities, aerospace companies, universities, law and engineering firms, magnetic levitation (maglev) scientists, labor unions, tourist boards, and the investment community. Membership also includes state Commissions and Transportation Departments as well as other public employees. As a consequence, our views represent a consensus based on a wide range of research and experience.

Membership in the Association continues to multiply. While many other Associations have had difficulty maintaining their membership through the recession, the roles of this organization kept growing every month. Our community shares the common goal of bringing the benefits of rapid, safe, economical and environmentally benign high-speed ground transportation technologies to the United States.

President Bill Clinton went on the record repeatedly during the campaign as being in favor of a high-speed rail program for the United States. He presented the public with sound reasons for such a program, saying:

> "I strongly support the development of high-speed rail because we need to ensure that we possess a transportation system that boosts American productivity and international competitiveness."

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[1] High speed rail is defined in the U.S. Code at 26 USCS Sec. 142(i)(1) as "any facility ... using vehicles that are reasonably expected to operate at speeds in excess of 150 miles per hour between scheduled stops..." This speed also is a widely accepted definition by professionals in this field.

> "Passenger rail service creates jobs, conserves energy and provides an opportunity to avoid airport expansion."
>
> "I think we ought to take defense cuts and invest them in building an economy of the 21st Century, including ... high-speed rail in particular. A half a million Americans would ride fast trains every day if we built them ... It will create an unbelievable number of jobs and really help our economy. Also, as you know, it will be good for air pollution out there in California and on the East Coast."
>
> "A Clinton Administration will use a portion of transportation funding and possibly funds transferred from defense to create a high-speed rail network between our nation's major cities. Bullet trains in five major corridors could serve 500,000 passengers a day at speeds up to 300 miles an hour."

Vice President Al Gore, in his book *Earth In The Balance*, wrote, "We should be emphasizing attractive and efficient forms of mass transportation .... New and improved forms of mass transit, like the magnetically levitated trains should be enthusiastically encouraged."

State and local governments, as well as public-private partnerships, are leading the way on high-speed systems, as follows (only one of these, the Northeast Corridor, is a Federally inspired project):

Planning For High Speed Rail Construction

- Florida
- Northeast Corridor
- Texas

High Speed Rail Studies Planned/Underway

- California (in-state)
- California-Nevada
- Illinois/Wisconsin/Michigan
- Maryland

- Massachusetts
- New York
- Ohio
- Pittsburgh
- Washington State

Interest in High Speed Rail Starting

- Arizona
- Georgia
- Louisiana
- Missouri
- North Carolina
- South Carolina
- Tennessee
- Virginia

OVERSEAS EXAMPLES

Congressional hearing records are replete with data about the remarkable developments overseas regarding high-speed trains.

The most recent development is in Spain. Last year, the Spanish put in service a new line for the AVE train -- the *Alta Velocidad Espanol*. The Spaniards, with a top speed of 155 mph, now have faster train service over the Sierra Morena Mountains between Madrid and Seville than Americans have anywhere. The Swedish have introduced the X-2000 to great acclaim and have increased passenger loadings. The Italians are expected to announce the construction of still more high-speed lines. Russia has formed a corporation to build a high-speed line between Moscow and St. Petersburg. The Germans now operate a successful new high-speed train called the Intercity Express, or ICE train. The French have the TGV, the world's fastest regularly scheduled train, operating at 186.4 mph to great acclaim. Overall, the Europeans are designing an international web of high-speed trains that will cost $205 billion.

Across the Pacific, projects are on the drawing boards for Korea and Taiwan. The Japanese are putting their third-generation Bullet Trains in operation -- faster and quieter than previous models -- while building more high-speed lines.

Maglev trains continue to experience breakthroughs. In Germany, the Transrapid maglev train has carried passengers on demonstration runs, many times at more than 250 miles-per-hour. The German government recently certified the system as reaching "technical readiness for revenue service."

Progress also is being made on a Japanese maglev train using similar technology, the High Speed Surface Transport (HSST). Another Japanese program is the Linear Motor Car maglev technology.

FEDERAL ACTION PLAN

Growth in transportation will be so significant that the United States will spend hundreds of billions of public and private dollars in the next 20 years on expanded transport capacity. There is no doubt about that -- all the experts in all of the modes agree. The question becomes not will we finance transport infrastructure, but how.

It is true that the Intermodal Surface Transportation Efficiency Act (ISTEA) contained several provisions designed to help high-speed train systems. However, those provisions are "enhancing" rather than "enabling." More needs to be done. To bring high-speed train programs from concept to reality, we need to eliminate institutional and financing roadblocks.

High-speed rail can lead the way for a new era in public-private investment in infrastructure. With that theme in mind, the following proposals are oriented to stimulate existing private-sector and state and local initiatives. The financial incentives that could be provided could include diversion of defense funding, tax-exempt bond financing as is provided to airports, a guaranteed obligations program, and investment tax credits.

We should look to funding a maglev prototype program in conjunction with industry. A maglev program is vital to our long-term technological prowess. We hope the Congress will give full support to Senator Daniel Patrick Moynihan and others in their drive to develop a maglev program.

Additionally, general fund financing of Amtrak's Northeast Corridor line is justified, a line that already is owned by the taxpayers.

It should be noted that I've recommended only those programs that already exist for aviation, or existed during aviation's formative years. I believe they are measured steps designed to put more equity in our transportation decision-making and funding processes.

No transportation service in the U.S. has developed commercially without meaningful participation by the government. Federal involvement has helped to bring about the transcontinental railroads, seaports and navigable waterways, the Pennsylvania Turnpike, the Interstate highway system, airports, air traffic control systems and even new aircraft.

LONG-TERM FINANCING ISSUES

Long-term, we should reexamine trust-fund financing. A report issued last year entitled *In Pursuit Of Speed* by the Transportation Research Board, a unit of the National Academy of Sciences, stated that high-speed ground transport systems could be an effective alternative in corridors where travel demand is increasing, but where adding capacity to reduce highway and airport congestion and delays is difficult. The study stated that no mechanism exists for introducing a new mode based on the savings achieved by reducing the need for more airports and highways or extending another mode's economic life. It suggested that if public outlays for high-speed rail are justified, they could include contributions from the aviation and highway trust funds because users of those systems will benefit.

The Aviation Trust Fund specifically should be opened to allow funding for access to airports for high-speed trains. Airports are intermodal facilities and create significant travel demand within their regions. Because most major U.S. airports are located within 25 miles of the cities they serve, legislative language could require that aviation trust fund financing of high-speed rail lines include stations located at airports as well as all terminal, track and signal facilities necessary to serve connecting aviation travelers. Provisions could require that such facilities do not exceed 25 miles in length per airport served.

Facilities constructed with such funds would be publicly owned and financing of maintenance shops, offices and rolling stock would be excluded. A tax could be placed on high-speed rail tickets at the going rate of tax on airplane tickets, with the proceeds going back into the aviation trust fund.

ADDITIONAL TRANSPORT CAPACITY NEEDED

Numerous reports are available from transportation agencies that identify the need in the United States to greatly expand transport capacity in future years. In our busiest travel corridors, high-capacity, high-tech, high-speed trains are an answer to mobility problems.

Our highway traffic continues to grow. In Florida, state officials are concerned with the traffic between Miami and Fort Lauderdale. Senator Bob Graham has stated that if nothing is done, 44 lanes would have to be in place after the turn of the century to handle the traffic. A highway of that magnitude would represent an unaffordable fiscal burden to the state. Florida officials say high-speed rail is not a "nice-to-have" item but is essential to insure future mobility in their fast-growing state.

Long-term trends for air traffic show continued growth. The nation's airports funnel more than 450 million passengers a year into our crowded air system. Air traffic delays are costly to both airlines and travelers. By 1996, 22 airports are expected to experience horrendous passenger delays. Aviation system congestion, or "winglock," will get worse. By substituting high-speed trains in the short-to medium-distance markets -- serving cities that are about 100-to-600 miles apart -- aviation congestion can be greatly alleviated.

HIGH SPEED RAIL WILL HELP AVIATION

From my dozen years in aerospace and aviation, I'm convinced that high-speed trains will become an integral part of aviation's future. It's inevitable that airline traffic will bounce back in a big way. Then, high-speed rail will be even more vital to our busiest corridors. It's possible that, in future years, the airlines may operate such trains.

We need to start building the right kind of infrastructure in the right places. I may be a high-speed rail advocate, but I also argue for new airports. Last year, on a speaking tour around the nation, I supported new airports for Denver, Seattle, Phoenix, Atlanta, Birmingham and Southern California. Future airports will be built in outlying locations, but only when they can be connected to cities by high-speed trains.

However, in places like New York and Philadelphia, there isn't room for more airports. We should begin to divert corridor travelers to high-speed trains.

Placement of high-speed train terminals at airports could improve operations at the nation's most crowded airports by diverting short-distance passengers from planes to trains, freeing slots for longer-distance aircraft use. Using slots in such a fashion could improve the operational efficiency of the entire airline industry. Such an intermodal spirit is sorely needed in our planning process.

The agonizing monetary and social costs of additional airports is one of the reasons why the Europeans are investing in high-speed rail systems and connecting them directly to air terminals. Several airlines are leaders in air-rail services.

- Last summer, Alitalia Airlines began operating non-stop trains out of Rome's airport to Florence and Naples. Giovanni Bisignani, Alitalia's chief executive officer, reports that the trains are proving "very popular." The airline admits it may purchase high-speed trains for future expansions.

- Lufthansa Airlines has integrated train service with its airline service at its busy Frankfurt airport. The airline is looking to expand the service and may ultimately utilize the high-speed ICE trains.

- Swissair and Swiss Rail have integrated services at the Zurich and Geneva airports.

- Virgin Atlantic Airways may start rail service between Edinburgh and London, with the airline's chairman, Richard Branson, saying: "Trains are a lot less expensive than planes."

Pierre Jeanniot, chief executive of the International Air Transport Association (IATA), said, "I am generally in favor of the high-speed train. One may ask, 'How the devil can a man who devoted his life-long career to the aerial domain start promoting the train?' Well, I do not perceive the high-speed train as a rival of the plane but more as a complement to our North American environment....Train-plane intermodality has already been proven elsewhere in the world."

Thomas Stephen Windmuller, also of IATA, and a former Vice President for American Airlines, said, "Even to the extent that high-speed rail does take customers from airlines on individual, relatively short-haul routes, in doing so valuable slots are freed up for airlines to devote to the relatively more profitable longer-haul routes."

The IATA represents airlines that carry 98 percent of all scheduled international traffic.

Domestic experts have spoken, too. Former USAir Chairman Ed Colodny has endorsed the high-speed rail idea, particularly for the East Coast. The March 8, 1993, edition of a new publication entitled *Maglev News* reported that negotiations are underway that would result in USAir financially supporting a high-speed train project in hopes of bolstering its own future. According to Managing Editor Douglas John Bowen, "USAir, the sixth largest commercial air carrier in the U.S. based on revenue passenger miles traveled, has acknowledged that it plans to help fund the 19-mile maglev demonstration project in Pittsburgh. The airline intends to join Maglev Inc., which is the consortium of business, labor and educational groups that is developing the system .... USAir's willingness to commit funds to the Pittsburgh project is significant, given the current financial stress on the company's airline operations and in the airline industry in general .... Officials at the airline have expressed interest in using high speed ground transport for short-haul services to supplement and possibly replace the short distance commuter flights, and to connect with more traditional air services for longer distance flights."

A leader in the air freight business has spoken up. Said James E. Tyler Jr. of Federal Express: "There is a serious need for alternate means of transportation, such as high-speed rail. Properly operated, it can offer real advantages that aircraft, by their very nature, may never be able to match. Not the least of these are all-weather reliability and en-route sorting [of packages]." The President of Federal Express recently toured the French TGV system.

Ron Davies, a McDonnell Douglas commercial jetliner marketing legend, now the Curator of Air Transport at the Smithsonian's Air & Space Museum, calls a high-speed train program a "campaign for common sense."

Important aviation suppliers are getting on board, with the following companies now members of this Association:

Aerotrans
Bell Helicopter Textron
Grumman Corporation
Huck Manufacturing
Hughes Aircraft
ITT Research Institute
Martin Marietta
Science Applications International Corporation (SAIC)
Suppliers of Advanced Composite Materials Association

Airport executives in Miami, Orlando, Pittsburgh, Los Angeles and New York are interested in links with high-speed lines. The Orlando International Airport petitioned the state to locate their facility on the proposed Miami-Orlando-Tampa advanced train system, in addition to being served by the maglev line, and requested 24-hour-a-day train service.

Even flight crews have endorsed high-speed rail. For example, when I appeared on WXYT radio in Detroit, one of the callers said, "I'm a captain of a Boeing 747 .... We need to offload short-distance passengers to lessen airport congestion. It's very expensive for my company when we experience delays in takeoffs and landings for 747s. High-speed rail is a good idea." Such unsolicited comments have been made by pilots on other shows throughout 1992.

Finally, my book *Supertrains: Solutions To America's Transportation Gridlock* (St. Martin's Press, 1992) has been applauded by Lufthansa's new chairman, Jürgen Weber, who said it's "a super idea to promote the super trains." James P. Woolsey, editor of *Air Transport World*, "The Magazine of World Airline Management," wrote that it is a "fine book, which makes a good case for the virtues of the high-speed rail technologies. A good-enough case, I feel, that they should be considered as alternatives to the current transport policy of ... hoping a new airport might be built somewhere, someday."

SUPPORT FROM OTHER INTERESTS

What has gone unrecognized is the extent to which other organizations are helping bring the high-speed rail idea to life. The American Trucking Associations as well as the American Association of State Highway & Transportation Officials (AASHTO) supported the ISTEA change to permit rights-of-way of Federal-aid highways to be utilized by future high-speed lines. The Electric Transportation Coalition has endorsed the use of tax-exempt bonds to build high-speed lines while the Edison Electric Institute has supported us in numerous ways. Last week we participated in a joint news conference with the American Public Transit Association and the Community Transportation Association regarding improvements to America's surface transport network. I will soon begin a program of cooperation with three high-tech organizations -- IVHS America, the Council on Superconductivity, and Suppliers of Advanced Composite Materials Association.

Financial experts have also stepped forward on this subject. Although they raise hard issues concerning private financing, these experts are able to offer solutions regarding capital formation for such systems. In testimony last week, Harriett Stanley of The Hadley Group outlined a program to remove obstacles to investment of private capital. Micah Green, Executive Vice President of the Public Securities Association, testified that one of the most effective ways for the government to assist the development of high-speed rail is by permitting tax-exempt bond financing. It's significant that this bond provision also is supported by the Friends of the Earth and other environmental organizations.

JOBS

Thousands of new jobs could be created through institution of high-speed rail programs. Approximately 85 percent of all capital expenditures for high-speed surface systems are in infrastructure (tracks or guideways, stations, parking lots, electrical and signaling systems, maintenance bases, etc.) while only 15 percent would be expended for the actual trains. The trains would be manufactured in the United States to the benefit of domestic industries. It is for these reasons that Texas AFL-CIO President Joe D. Gunn has endorsed the Texas high-speed rail project, the construction of which could create 100,000 person-years of work, as a "bold and visionary approach."

ENVIRONMENTAL BENEFITS OF HIGH SPEED RAIL SERVICE

The creation of high-speed rail systems can stimulate the economy while bringing about environmentally benign transportation infrastructure. The benefits of high-speed rail are thoroughly documented. Therefore, only a summary need be presented here:

> Energy Savings: The nation would benefit by shifting travelers from oil-dependent systems to electrified trains for selected short- and medium-distance travel. No form of intercity travel is as energy-efficient as high-speed trains. The Edison Electric Institute reports that U.S. powerplants generate only four percent of their electricity with oil. Therefore, a shift to electrified high-speed trains on any one route would benefit the entire nation.
>
> Reduction in Pollution: Such trains would reduce air pollution in some of our largest urban areas because electrical power plants place far fewer pollutants in the air than the accumulation of individual auto and jetliner exhausts. According to Southern California Edison, studies sponsored by the Natural Resources Defense Council show that electric high-speed trains are up to 98 percent cleaner than the vehicles they would displace.

Land Savings: High-speed trains are high-capacity systems requiring only small amounts of land. Such trains would reduce the "land take" required for an expansion of transport infrastructure (e.g., the land required for the entire French high-speed rail system is less than that required for the Charles de Gaulle Airport in Paris alone).

Safest Form of Travel: High-speed trains are the safest form of transportation ever devised. Such systems have operated in Japan for 28 years and France for a decade. Together, the trains have served more than 3-1/2 billion passengers. Yet, these systems have not suffered a single passenger fatality. If America made transport decisions based on safety alone, it would have high-speed trains in service on a number of high-travel routes.

CONCLUSION

The greatest level of activity on this issue remains at the state level and the grass roots level. Despite the passage of ISTEA, Washington continues to be a follower rather than a leader. I do believe this is changing. As the Persian Gulf War ended, Senate Majority Leader George Mitchell asked, "If we can build a high-speed Patriot missile, can't we build a high-speed train?" More than ever, more Members of Congress, more Governors, more state legislators and more business and labor leaders are saying, "Yes, we can."

The Administration and the Congress should set as a goal that America will have the world's finest high-speed surface transportation available. It is an achievable goal.

Mr. Chairman, I thank you and the Members of this Committee for this opportunity to appear before you today. I would be pleased to answer any questions you may have.

# # #

STANDARD GUIDELINES FOR REVENUE AND RIDERSHIP FORECASTING

Mr. Carr. Without objection, we will include the document, Standard Guidelines for Revenue and Ridership Forecasting in the record.

[The information follows:]

HIGH SPEED RAIL
ASSOCIATION

STANDARD GUIDELINES FOR REVENUE AND RIDERSHIP FORECASTING

Guidelines Committee
Jack Hargrove, Chairman
September 25, 1986

206 Valley Court, Suite 800, Pittsburgh, PA 15237 (412) 364-9306

STANDARD GUIDELINES FOR REVENUE AND RIDERSHIP FORECASTING

I. Introduction

1. Revenue and ridership forecasts for high speed rail projects have become the most critical element in determining these projects' feasibility, in gaining public support for them, and in funding them. The quality and comprehensiveness of forecasts in the last few years have varied, and the sheer number of possible approaches has led to confusion and even disbelief among the public, the investment community, and government officials.

2. These guidelines are meant to aid the non-specialist reviewer determine whether a particular forecast contains all of the needed elements of a revenue and ridership forecast for high speed rail service. The guidelines are also meant to help the forecaster develop information to more credibly answer the questions that the public, reviewing agencies, and investors raise, by clearly stating assumptions, by providing a forecast and sensitivity tests based on several forecasting techniques, by providing sufficient detail, and by relying on current data and forecasts.

3. These guidelines are intended to apply to forecasts used to support investment and funding decisions. Less comprehensive forecasts may be useful at preliminary stages to determine whether a project has a chance of financial feasibility, but the more that a forecast follows these guidelines, the more it will serve as an adequate document to obtain funding and support from either the public or private sector.

4. The forecast and all references to the results should clearly state whether the forecast is intended to be used in investment and funding decisions, or for pre-feasibility or other less exacting study.

5. A revenue and ridership forecast is based upon an assumed capital infrastructure and operating plan. The forecast should draw an explicit link between the forecast and the infrastructure and operations needed to handle the volume of traffic.

6. The guidelines are divided into the following sections:

Section II: Preparation & Presentation of Ranges in the Forecast
Section III: Multiple Approaches
Section IV: Sensitivity Tests for Key Variables
Section V: Gathering Current Data for the Analysis
Section VI: Forecast Detail
Section VII: Tests of Reasonableness

II. Preparation & Presentation of Uncertainty in the Forecast

7. A precise forecast with full certainty of either the future state of economic systems, or of human behavior when presented with a new choice is not possible. Since forecasts of revenue and ridership depend on forecasts of both of these, the preparation and presentation of ridership and revenue forecasts will contain this type of uncertainty, which should be documented explicitly in the work performed.

8. Nonetheless, a "most probable" forecast should be developed. It should represent the situation where it is equally likely that the actual results would be below the forecast as above it.

9. The "most probable" forecast should be made using: i) several valid approaches that have as different a perspective on the problem of forecasting as possible, and ii) sensitivity tests to determine how the forecast changes with changes in key variables.

10. To the greatest extent reasonable, the forecaster should seek to have outside independent experts review the sensitivity tests and forecast models, and to incorporate their views into the final results.

11. In explanations of the "most probable" forecast there should be a discussion of why the forecast could be higher or lower than the "most probable", and to what extent they could be different. It is imperative that the casual reader understand the assumptions and presence of uncertainty in each forecast and that the decision maker understand the magnitude of this uncertainty. All assumptions should be well documented so that the

reader can fully understand the rationale behind the forecast.

III. Multiple Approaches

12. Making a forecast using different models and approaches can help better define the range and uncertainty of that forecast. The various perspectives provided by different approaches can improve the quality of the forecast. This is especially true when the approaches differ significantly in methodology and variables.

13. The forecast should incorporate results from each of the three approaches listed below.

    - Current market research
    - Mathematical simulation models
    - Consensus of experts and decision makers

14. Of the three approaches, current market research is probably the most important. Surveys, either in person or by phone, provide a direct estimate of demand for a service as well as current detailed information to use in the subsequent modeling and consensus discussions.

15. Focus groups are detailed discussions of a service's attributes with a small group of potential users to uncover attitudes and perceptions that may not be apparent from surveys. In order to be most useful and believeable, the market research should be conducted prior to and independently of the model analysis, and results should be documented before the model analysis begins.

16. The mathematical simulation models provide more analytical approaches to specific segments of the market. Depending on the market, many different models are available. Generally speaking, existing models can be divided into those which forecast long distance travel (trips longer than 50-75 miles) and those which forecast local travel. Local models are relatively non-transferrable, i.e. a model to predict Miami metropolitan area local travel cannot be simply converted to predict Chicago local travel. Long distance travel models, though, are generally transferrable within the U.S. and Canada, although each model needs adjustment before use in a new corridor. A general description of current models and their strengths and weaknesses can be found in Koppelman, F.S., G.K. Kuah, and M. Hirsch's "Review of Intercity Passenger Travel Demand Modeling: Mid 60's to the Mid 80's" draft report, Northwestern University, September, 1984.

17. New models may be developed and may prove superior in any specific forecast. If such models are used, however, the onus is on the forecaster to demonstrate the superiority of the technique and to back it up with full documentation.

18. The forecast should use two or more different mathematical models in order to provide diverse perspectives and cross-checks of the forecast. The forecast should clearly identify which models are used, should justify their selection, should defend the method of adapting the model to the specific corridor, and should provide documentation of the models' form. A thorough validation of the selected models should be performed, and reported, to confirm that they predict current travel patterns and behavior reasonably well.

19. In order to provide further perspective on the forecast, review by outside experts and decision makers should be sought at several stages in the work. At a minimum, the review should cover: i) the workplan for market research, ii) the results of the market research, iii) the sensitivity tests proposed for the important variables, iv) the applicability of the models to the corridor, and v) the results of the models. In addition, consensus should be sought from the reviewers on the "most probable" forecast.

IV. Sensitivity Tests for Key Variables

20. While it would be desirable to establish a degree of certainty and a defined range for the forecast (such as "there is a 90% chance that the ridership will be between 8 and 10 thousand people daily"), it is not possible because we lack enough experience with forecasts and their accuracy. Therefore the uncertainty in an estimate should be demonstrated by sensitivity tests on key variables.

21. For each model, the variables which significantly affect the forecast should be identified. For each such variable a pessimistic and optimistic value should be estimated. These values should be chosen to cover the widest possible range of reasonable values. For example, if the time it takes to drive from A to B is a key variable, and the "most probable" forecast is an hour's drive on freeways with some congestion, a range might run from the time it would take at an average speed of 65 mph (implying a

removal of congestion and current levels of enforcement of the 55 mph speed limit) to the time it would take at the average urban speed (implying a saturation of the freeway to the point where it is no easier to take the freeway than any other street). The values of the range should be clearly displayed, and the rationale for choosing the range should be explained.

22. For each model, the effect on the forecast of the range of values for each single variable should be shown. Further, the effect of changes in reasonable combinations of variables should be shown. It may be useful to display the variations graphically, to allow the reader to grasp the extent of variation in the forecast.

V. Current Data Gathering for the Analysis

23. The validity of any forecast depends strongly on accurately understanding current travel patterns and current and future trip characteristics. Variables such as trip time or cost for the new mode are relatively easy to determine, but descriptions of the trips that travellers make today are generally insufficient or outdated, running back to the 1960s.

24. Up-to-date information should be gathered on the precise local origins and destinations of trips, and their other characteristics, using the techniques described below. The characteristics and the amount of detail needed are discussed in Section VI, "Forecast Detail".

25. In addition, attention must be paid to the variables which describe the future land use patterns, transportation networks, and competitive environment including deregulation of competing air and bus modes.

26. The information should be gathered in such a way as to depict seasonal changes in travel and variations due to rush hour and weekend traffic.

27. The forecast must document the method of surveying and the questionnaire; the data must be maintained in a form which can be checked independently if necessary.

28. There is extensive literature on conducting surveys and using their results. These guidelines only present the most important elements for an investment grade forecast; all other rules for proper interview and statistical analysis should be followed.

29. In Person Traveller Surveys:
Travellers on all modes of travel in the corridor should be surveyed in sufficient numbers to achieve comparable levels of confidence in the results from each mode. In some cases, especially auto travel, the preferred method is to interview travellers at some point in their journey where they can spend 5-10 minutes to answer the questions asked by a trained interviewer. For such an interview a response rate of at least 75% is desirable. Alternate methods of collecting the information, such as having the questions answered on a form by the traveller, may also be adequate if the response rate is high enough. Train, bus, or air travellers can thus be interviewed in airports, stations, or in the vehicles, if permission can be secured.

30. The selection of travellers to interview should be statistically random. A large enough group should be surveyed to establish high confidence limits on the representativeness of the interviewed group. The survey questionnaire should be pretested and reviewed by the independent review committee.

31. Telephone Surveys:
Description of trips should be sought from people who have made trips in the corridor as recently as possible, since recall of trips can become difficult after several months. If there is significant tourist or out-of-area business travel, the telephone survey must be supplemented with other surveys. The telephone survey should also be conducted to ensure its statistical validity.

32. Focus groups:
By design, this technique of interviewing small groups of people in depth is impressionistic and potentially less representative of the market as a whole. In addition it is very difficult to adequately and fairly display the characteristics of a new system to people who have not experienced it elsewhere.

33. Focus group results can be a valuable part of the work to understand the reaction to new service, but data from these sessions should not be used as the sole evidence for important parts of a forecast such as price sensitivity or likely usage of a service.

34. Incorporating future transportation, land use and development plans:
A wide range of public officials and private entities should be interviewed to establish what changes to the corridor's infrastructure, travel patterns and competitive environment is likely to occur. These should be

incorporated into the models and should be documented.

VI. Forecast Detail

35. The forecast must contain sufficient detail to answer questions commonly posed by the public, government officials and investors. Some of these questions test the reasonableness of the forecast and check the internal consistency of the models. Other questions generate information for evaluations of environmental and economic impact. The detail that is discussed below is the minimum needed to prepare a defensible and useful forecast. Of course, additional classifications and subdivisions may be useful, but the intention in this section is to define the major issues which must be addressed.

36. The forecast should note that the range of variation for each individual part of the forecast is likely to be greater than for the forecast as a whole, and should make an effort to estimate the change in certainty.

37. Consistent use must be made of either actual or perceived time and cost of travel. In its description of detail the forecast should clearly state which assumptions were made.

38. Origin & Destination:
In most instances, the only information generally available on an origin & destination basis is the number of riders. Since a major point of a ridership and revenue study is to determine the financial parameters of a proposed service, information on revenues, fares, and cost of the service and of competing modes should also be displayed on an origin & destination basis. Other information by origin & destination is also helpful to understand the forecast, notably the trip characteristics (frequency of departure, length of trip, access/egress information, group size etc.) assumed for each mode and trip purpose of travellers. The model or market share of the service should be displayed for each trip purpose by origin and destination.

39. Trip Purpose:
The rationale for a division of travellers into groups defined by purpose of trip is a strong one, since each group has demonstrably different sensitivities to trip length, convenience of departure, and price of trip, and since their travel patterns vary considerably.

40. The customary division between business and non-business travel is insufficiently detailed to answer important questions about the presence of commuter traffic. At a minimum, the forecast should divide the market into three categories: commuter, business travel and non-business travel. In markets where special travel such as tourism is important, a separate category should be established.

41. The forecast should display the current total market by trip purpose, identify the markets considered for the high speed service, and display the trip purposes of those using the high speed service.

42. Trip characteristics by trip purpose and mode:
Information should be developed to allow a description of the typical trip for each trip purpose. The following information should be developed.

- Time of trip during the day
- Duration of trip
- Cost of trip & cost paid by company
- Number of persons in the party

43. Total Travel Cost & Time by Mode:
Total cost & total trip time are important variables in most models, yet many forecasts concentrate only on the line haul portions of the trip and do not explicitly address the modes of travel people will use to get to and from a rail station, nor their cost and time.

44. Inasmuch as this is an important source of questions, the forecast should be very explicit about access and egress modes. At a minimum, the following should be displayed by origins and destinations or by station as appropriate.

- Line haul travel cost & time by mode, by origin and destination, future and present

- Access cost & time by mode, by origin and destination, future and present

- Total cost & time by mode, by origin and destination, future and present

- Mix of modes of access and egress assumed by station, future and present

- Access cost & time by mode by station

45. Induced Travel & Land Use Change Related Travel:
Induced travel is the travel which did not exist prior to an improvement in the

transportation offered. For example, about 1.5 million more people travelled annually on all modes between Paris and Lyon when rail service cut travel time to two hours. This inducement to travel is built into many mathematical models, and results in added rail travel. The method of calculation and the amount of induced travel in total, as well as the percentage captured by the rail service should be displayed.

46. Added travel from changes in land use is generally acknowledged to exist, but it has proven difficult to quantify. However, where there is a demonstrated ability and will to accommodate increased density (and therefore greater trip generation), and the increase can be expressed quantitatively, induced travel should be included in the forecast. If it is included, added travel from this source should be displayed by origin and destination, and the rationale for increased trip making explained for each station.

47. Service Attributes, Perception/Fashionableness of Rail Service, Preference Factors: These non-quantifiable model attributes need to be considered in the forecast. Any improvements over existing conditions that are postulated and that affect the forecast must be supportable from the survey or focus group work which has been performed. The nature of the changes should be documented and the effect on the ridership and revenue forecast quantified.

VII. Tests of Reasonableness

48. A number of questions serve for many people as checks on how reasonable the forecasts are. While it is impossible to establish hard and fast rules to separate the reasonable forecast from the unreasonable, these questions are listed as ones which the forecast must be prepared to answer in convincing fashion.

    a) How much shift is expected from competing modes to the high speed rail services?

    b) How much does the forecast depend on induced or land use change travel?

    c) How vulnerable is the forecast to competitive actions such as lowering of air fares?

    d) Will the construction of new highways undercut assumptions about road congestion that have been made?

    e) How do the land use plans around stations help or hinder the development of rail traffic?

    f) What are the necessary improvements in access and egress, and who will bear the burden of making and sustaining them?

    g) Is the forecast dependent on an economic activity such as tourism or gambling which are vulnerable to changes in economic conditions, fashions, and legal considerations?

    h) How comparable are the forecast results to the situation in other locations with high speed rail service?

HIGH-SPEED RAIL DEVELOPMENT VS. OTHER ADVANCE TECHNOLOGIES

Mr. CARR. This Committee is going to be embarking, this year in particular, on a study of forecasting and forecast methodology. We listened until our eyes glazed over about forecasts and in our own anecdotal experience have found that the forecasts aren't really very helpful. What we're trying to do in all modes is to figure out what is a good forecast, and determine how we can ask better questions of those that give us forecast numbers, so that we know exactly what we're dealing with.

No one today so far has mentioned two other competing technologies. Both the Office of Technology Assessment and the Transportation Research Board mention that high-speed rail should be evaluated against coming developments in tilt rotors and intelligent vehicle-highway systems.

Anybody want to take a crack at making a comparison? This Committee, incidentally, asked that a study be done to evaluate high-speed rail and tilt rotor technology. This Subcommittee, I think, is less interested in the particular mode of travel than where are people and where do they want to be. The speed of a particular mode of any trip is probably less important to us than the overall trip speed.

One of the things that gets conveniently left out, probably because there is no data, is the data relative to the automobile. I guess it raises certain privacy issues, obviously, to start asking people to tell us where they went on every tenth trip. I can imagine some sitcom stories that would be coming out of that kind of a requirement. Nonetheless, we do have to get some data and perhaps with IVHS we can begin to get it in a way that doesn't violate privacy issues and is not intrusive.

So again, going back to data, and we probably should have asked Mr. Kelleher this while he was here. How can we get better data to make more informed decisions? Where is the economic payoff?

And I might say, Mr. Vranich, I was delighted to hear you put on the record that you are in favor of the incremental approach as articulated by Mr. Claytor today. But beyond that, where should we be going?

Mr. VRANICH. My answer is sort of a bad news/good news thing. I always like to start with the bad news first. I am not real enamored of the tilt rotor aircraft for a basic reason. Although I work for a company that was involved with developing that aircraft for military purposes, the fact is that the ride characteristics of such will be uncomfortable and I'm speaking subjectively, of course, but I think people just won't buy it. The ride is going to be very similar to a helicopter ride. And there is not one scheduled helicopter service in the United States today.

The last one was in Boston taking people to Logan Airport, and if that one could not survive, I'm not sure about the future of scheduled helicopter services but the tilt rotor offers that kind of a ride. It's uncomfortable, it's bouncy, it doesn't give you a good feeling. I would much rather get to Mr. Kelleher's 737, a fine airplane. I would rather get on Amtrak's Metroliner or a high-speed train. I have a feeling that its application is limited.

And let's says that I'm incorrect, then the question is how much am I incorrect? If the commercialization of the tilt rotor takes place, I think the numbers will be so small that I don't know how you ever get enough revenue to justify capitalizing the commercial version of such an aircraft.

IVHS I feel far more positive about. I feel there are so many startling new developments occurring in ground transportation, one of the things this association will do within the next week is we have been invited to meet with IVHS and work with them cooperatively because we think we are in the same business trying to get people to alter their transportation decisions and we have also worked with the Electric Transportation Coalition which includes automakers.

So I'm really hopeful that there are a number of alternative schemes on the horizon that simply will make travel better and that's IVHS, that singular high-speed rail line, that high-speed train into airports. I think a whole new world is coming at us in the next century.

Mr. CARR. I ought to say for the people who might be listening in on C–SPAN that IVHS stands for intelligent highway vehicle systems.

Mr. MULVEY. Teleconferencing is something that needs to be considered in the future of transportation. It's assumed that we are going to have the same rate of growth in travel or transportation that we had in the last 40 or 50 years but there are things like teleconferences and telecommunications that might gain to change the travel that we do. This needs to be taken in account in the sensitivity analysis when we do our demand forecasting.

Mr. MEAD. I'd like to get to the heart of your question, if I understood it, it also included a component of how will we determine what the yield will be from either tilt rotor versus maglev, versus IVHS. And I should say that I think you are going to be facing that decision later this year because currently the department is putting dollars into various smart-car research projects.

Maglev, you will be getting a funding request I would imagine sometime this year for maglev, and the department is not well-positioned, the facts are, to give you a good answer on that. And much hope must be placed on that Bureau of Transportation statistics, which is brand-new.

Mr. CARR. Well, at least this Member is going to be asking for data. I think some of this whole area is infected with what I would say is political enthusiasm rather than hard-nosed evaluation.

And it makes it difficult, as I indicated in my example with the Monorail at Disneyland, because our country has major and massive infrastructure needs. We cannot possibly fulfill all the needs that we know of in terms of maintenance alone today, much less launch off on creating amusement rides for the benefit of a few people who just have a wild enthusiasm whatever reason.

Nonetheless, I think we ought to be open-minded about possibilities for the future and not constrain our descendants to the sins of the past. And in that case, the past is now. So, I think we want to be open-minded about how we move transportation along, but we probably need to be much more market sensitive than technology sensitive.

It appears that one of the great competitors, particularly for rail, is the automobile. We also know that automobile ownership is a lot less in Europe and in Japan for congestion reasons and their own denser living patterns than we have.

It just seems to me that the perception that a person has about what it costs is a motivator on what mode the person chooses. And even though the perception of automobile costs tend to be a lot less, the perception of the motorist is to take the marginal cost of that additional trip. They don't assume the wear and tear, the depreciation and the whole host of other costs, because they need that car anyway. So the marginal cost isn't a bad way to look at it.

We don't have a lot of data, but, what about these comparisons with the Japanese and the Europeans, Mr. Mead?

Mr. MEAD. I think that particularly on the European front, it is certainly—Europe has had an established rail infrastructure to the center city for many years. There are a lot of distinguishable features. One of them you alluded to is the automobile. The price of gasoline is also considerably more costly in Europe than it is here. That is one factor. Airlines is another. Air fares in Europe are much higher than they are for Southwest Airlines in Texas. And that has a sharp bearing on what types of transport people will take.

And I just think there are a lot of distinguishing features. At the same time it is true that in Europe that the center governments got behind the rail infrastructure.

Mr. CARR. They got behind a lot of industries. Their own socioeconomic tradition is different than ours. Shouldn't we reject, Mr. Vranich, the notion that since they have a nice train, why shouldn't we?

Mr. VRANICH. No, because I think we are dealing a little bit with myths here. One of the things that I point out in my book "Supertrains" several times because I think it's important is that several of those statements are true but it's only part of the story. We have the highest per capita travel in the world in the United States.

Americans simply travel more than the French do and the Germans and therefore we have a market that needs to be served. We do have, contrary to earlier comments, we do have congested facilities. Several months ago while flying out of DFW to Washington, I believe my airplane was number 32 in line. That is congestion that needs to be dealt with. We do have communities that are unbelievable tourist centers in the U.S. that they simply don't have in Europe, for example Orlando and Las Vegas both of which are calls for high-speed rail systems and tourism is an important component of our economy.

None of the high-speed advocates, the credible ones are not promoting high-speed rail from New York to LA or Chicago to Dallas. That is aviation's job. I think in cases like Chicago's O'Hare Airport to Milwaukee for example, has 54 flights a day and I can envision where we are getting to intermodal in their thinking and have those to be 54 trains a day. Then those 54 slots will be used for longer distance flights that actually will help aviation.

So I think there are differences, but I think the most important thing I could say is this issue of transit conductivity to the trains is moot because we already have high-speed terminals in this country right now. They are called airports and only three our four of them are served by transit. How does everybody else get to DFW or LAX? They get in their car and they drive. I say for trains it's no different. People are going to get in their automobiles. These train stations must have huge parking facilities.

Transit conductivity is important in Japan because that's the way they move. Highway access to train station is what is important in the U.S. because that is the way we access high-speed terminals.

Mr. MEAD. I think it's important to know that in Germany's case, although they are developing the maglev, their Ministry of Transport has committed to a steel wheel on steel rail system. It's the Ministry of Research and Development that is sponsoring the maglev. But that isn't a technology that you are going to be seeing in use in Germany.

Mr. CARR. Mr. Vranich, I am a rail user. There was a point in my life when my wife lived in Philadelphia and I was on Amtrak all the time. The same thing could be said of Amtrak. There were many times that some problem on the line between here and Philadelphia knocked out the whole system for hours on end. I mean, you don't get away from that because it is rail. You have those congestion problems and conflicts at airports and you have them on highways.

I mean those things happen. We have an airline system today that has overcapacity. That's one of the reasons why a lot of airlines aren't making any money. And there is still capacity that can be achieved in the air on relatively short distances. There are delays due to weather. I just spent 24 hours in the Detroit airport. It had nothing to do with what the airlines could produce. And certainly high-speed rail would have had the same problem if there was one between Detroit and Washington.

Mr. VRANICH. Too long a distance. Detroit to Washington, I don't consider a high-speed rail market. I believe that's aviation's job.

Mr. CARR. I'm informed that Mr. Wolf has a few questions and must leave soon. I yield to the gentleman from Virginia.

ADMINISTRATION'S REQUEST

Mr. WOLF. Thank you, I have a number of questions and I will submit a number for the record. But when the Clinton administration supports high-speed rail, are they talking about ultra high-speed rail or high-speed rail, to get back to Mr. Claytor's comments?

Mr. MEAD. It is not clear. We tried to do some digging before this hearing both by looking at the vision of change documents and talking to various administration people at DOT and OMB. And it is simply not clear.

Mr. MULVEY. The indications from the discussion about what we need to do in terms of investing in new technology would suggest that there is an interest in ultra high-speed rail, maglev or the TGV kind of systems. But it's not clear from the documents available and it won't be clear until we see the budget statement.

Mr. VRANICH. I think that they are breaking it into two components. One is the shorter term thing. Let's do more for Amtrak.

Let's support putting tax exempt bonds under the same rules as tax exempt airport bonds to get things moving. And I think that's all the shorter term effort. And there appears to be a longer term component in dealing with maglev because the feeling is if we don't move on maglev, the Germans and Japanese are and we are going to lose out to this technology, so this seems to be a short-term and long-term thing but have I no idea what the line items would be.

DULLES AIRPORT CORRIDOR

Mr. WOLF. Is the Dulles Airport corridor—which is not in my district; Dulles is, but most of the corridor is not—is that a legitimate corridor that should be looked at with regard to maglev? Because Mr. Claytor was talking about a 15-mile corridor that would actually work and be used 10 or 15 times a day.

Mr. VRANICH. I think it is. I can see that someday we would have a Northeast Corridor that is maglev, it will stop at BWI, at the Capitol and go on out to Dulles and somewhere else for all I know. I view maglev as something that is to be integrated with the aviation system. And if you are going to tie in with aviation, tying in with Dulles makes sense. That is something that would have to be looked at by experts more expert than I.

Mr. WOLF. I was wondering about the connection of BWI to Dulles to National. Does that make sense?

Mr. MEAD. It is a possibility, but you want to make sure that if you are going to buy a train that can go 300 miles as hour, that you are able to get up to that speed. That would be a concern. I think the answer for the earlier framework for Dulles was a place in Falls Church to Dulles and I think the answer in that case for maglev is no. It's too short.

Mr. WOLF. And it wouldn't be pragmatic to have stops.

Mr. MEAD. No. I think that is an issue that Mr. Claytor is going to have to face on the X2000, how often are we going to have this train stop that is capable of doing 200 miles an hour.

DIFFERENCES BETWEEN EUROPE AND THE UNITED STATES

Mr. WOLF. Why hasn't Germany moved ahead on this?

Mr. VRANICH. They have a commitment to the Deutche Bundesban. They find it easier to upgrade that for higher speed passenger trains but there is a major difference between railroads between Germany and the United States. The German freight trains are very light. The axel loadings are not very significant. Therefore the trains do not do much damage to the track the way American freight trains do.

Their trains are shorter so you can finesse the operation of high-speed or higher speed passenger trains in and about the freight train systems of France than we can here. We have these long, lumbering 100 car trains that are difficult to get around. So the engineering is different. The operating practices are different.

The corporate culture, so to speak for their railroad is much different than ours, so they find it easier to upgrade. We, on the other hand, and I would say, I do think maglev is for the long haul, but I would point out that from the U.S., we have something they don't have. Between Anaheim and Las Vegas we have significant mountains that you have to cross. We may be able to build a maglev line there for $1 billion less than a steel wheel line.

They have looked at it from a technological standpoint. We ought to be looking at it from a technological standpoint and transportation standpoint.

Mr. WOLF. Has anyone looked at the comparisons? I come from Philadelphia, always believed in mass transit, and took the trolley car to work there. Why couldn't we do better? Then I start looking at the gasoline costs. The gasoline cost in Germany is much higher than it is here in the United States. The average family here owns many more cars than they do in Europe. And the Americans want to keep it that way. That seems to be an interest.

Distances, you go from Bonn to Berlin. Here fine, you can do it cheaper, whereas to fly between capitals and cities in Europe is very, very expensive. Has anyone looked at all of this and laid out the comparisons on an objective basis? Somebody who doesn't represent the airlines, the railroads, or the automobile manufacturers? Has anyone looked at it on an objective basis?

Mr. MULVEY. The TRB report discusses it a little bit. The Transportation Resource Board looked at the experience in Europe how it relates to the United States and where we can learn from them; where there are similarities and where there are differences, and there are a lot of differences between the United States and Europe. But there are changes going on in Europe. More and more people in Europe today are choosing to drive as investments in the highway system are being made there. There is more long-distance driving, even with the very high cost of driving in Europe.

So I'm not sure, if getting more like the Europeans. To some extent, the trends show they are getting more like us.

Mr. WOLF. If you could submit to the committee some comparison so that we could get some sense of what are the different options. I thank all of the witnesses. Thank you, Mr. Chairman.

[The information follows:]

There are a number of differences between Europe and the United States that help explain why HSGT has progressed further in Europe and why the European experience might not be directly transferable to the U.S. These differences received some treatment in the 1991 Transportation Research Board study: *In Pursuit of Speed: New Options for Intercity Passenger Transport.* The differences trace to both socio-demographic and public policy factors.

On the demographic side, population densities in Europe are much higher than in the U.S. While the United States has 70 persons per square mile, Germany has more than 500 persons per square mile. In addition, within European urban areas the population is more concentrated and is more often connected to intercity rail passenger stations by intraurban rail networks. Rates of automobile ownership are also lower in Europe. While there are roughly .6 automobiles per person in the United States, there are only .32 cars per person in the United Kingdom and .41 cars per person in France.

The competitive situation is also very different in Europe. The cost of driving, for example, is much lower in the United States. Gasoline prices in the United States average around $1.15 per gallon, but are over $3.25 per gallon in Germany and nearly $4.70 in Italy. The United States also has a well developed system of airports and airline fares, especially since deregulations, are relatively low. Airline yields (fares per passenger mile) are nearly three times higher for scheduled airline service within Europe than in the United States. Europeans are much more likely to fly on air charters for leisure trips and these fares are closer to U.S. fares.

In general, the United States has invested in its aviation and highway systems while the Europeans have chosen to make greater investments in their rail networks. Because the Europeans have a history of relying on rail transportation for both urban and intercity trips, many observers believe that the success of high speed systems, such as the French TGV, cannot be readily transferred to the United States.

HIGH-SPEED RAIL SUBSIDIES VS. OTHER SUBSIDIES

Mr. **Carr**. As we move forward and people make proposals to us, should we require that high-speed rail be on a pay-as-you-go basis?

Mr. **Mead**. I don't think it's realistic to look at it that way, Mr. Chairman. For example, fare box recoveries in the mass transit area are about 40 percent. I just don't think it's realistic to look at a high-speed rail system as a system that can be expected to recoup both its capital and operating costs, if I got the sense of your question correct.

Mr. **Carr**. That's right. I mean, we require that the automobile and the highway be pay-as-you-go.

Mr. **Mead**. Also, Mr. Claytor didn't get into this, but these high-speed rail runs, we also may very likely incur greater operations costs initially because of the maintenance of the grade. So the operating costs alone are going to be substantial.

Mr. **Mulvey**. If I can get back to the issue of the data. These systems are going to require subsidies. There is no doubt about it. And the subsidies that we give them should be proportional to the public benefits: the energy savings, pollution abatement, and any safety benefits. You cannot measure or forecast those benefits without good data.

So good data help the public sector decide how much is worth investing and how much subsidy for these systems is desirable.

Mr. **Carr**. In other words, going ahead right now would be ill-advised until we have more data.

Mr. **Mulvey**. I think that's true. We need to get a better handle on what the public benefits are. Certainly competing with Southwest Airlines, which is a successful operation, is not a public benefit. To the extent you reduce pollution or you reduce congestion, and that reduction is measurable and demonstrable, there is a public benefit.

Mr. **Vranich**. I would answer the question differently because most often when I am asked the question, the person asking me presumes that aviation is not subsidized and I point out that I don't know how we can build train systems and compete against people that are. The FAA spent $45 billion for aviation projects in the 1980s but the aviation fund paid only $22.2 billion of that in taxes and user fees and the general fund paid the other $23 billion.

So there are all kinds of things available to aviation that the high-speed train people don't have, like publicly built infrastructure. I can't speak for the Texas project, but a large part of that project would be privately owned and would be paying taxes to every county they are going through. Airports don't pay taxes.

But the fact is that everybody moving in America is subsidized one way or another. I don't object to that. If you look in history, it's been the job of government since the Roman Empire to help infrastructure get built for commerce and for people to move. But I do think that the discussion takes an unusual turn in that we simply fail to acknowledge how we are spending our money today.

Mr. Carr. I might quarrel with you on some of that, I guess. The only aspect of aviation that you might say is subsidized is that portion of the air traffic control system which does not get an amount of money from the aviation trust fund. And indeed, there may be an argument that the aviation trust fund should subsidize it at 100 percent, and some people have advocated that.

But then again a great deal of the air traffic control system has been in the past historically devoted to our Nation's defense. The Transportation Department pays nothing for air traffic control, except for areas where they have a control that they are responsible for. So, from the standpoint of overall national security, a person could say that a big chunk of that support for the air traffic control system was justified based on national defense needs.

Furthermore, aviation pays for its weather. No one else pays for the weather. As a motorist, I don't have to pay for my weather. As a barge operator or a steamship operator, I don't have to pay for my weather. As a farmer, they tried to make me pay for it but I currently don't have to pay for it.

Aviation has to pay for its weather. So aviation is paying. Rail doesn't pay for its weather. Aviation is now being asked to pay for things that have absolutely nothing to do with aviation, like historic preservation, like wetlands, like transit systems. I mean, we have passenger facility charges now that I am highly critical of, but that isn't a passenger facility charge anymore. That is a tax on the airlines. They are eating that. They are not passing that on. The 10 percent ticket tax is not on the passenger; the airlines are paying for it. They are losing money. I think quite the opposite. I don't buy this notion that aviation has been subsidized.

Perhaps one area that we might reach agreement on is that aviation has, in fact, achieved certain spinoff benefits due to the space program and the defense research program. We are currently funding research in maglev and in the locomotives that Mr. Claytor talked about.

I think that's valuable for our country and for future generations but I take issue with the notion that airlines are subsidized.

Mr. Vranich. Mr. Carr, we will have to agree to disagree because the Aviation Trust Fund didn't come into being until 1970 when more than $17 billion went into aviation. Airports like La Guardia were built by the WPA. I would be happy to submit to you for your consideration, for the record, but I just think it would be important for you to take a look at it and come to your own decisions about how much of it is a subsidy, how much of it isn't.

I would point out that the association doesn't oppose any aviation project or oppose any subsidies because we have been trying to work with aviation, so I point this out with a little bit of reticence. I guess we will have to agree to disagree.

[The information follows:]

HIGH SPEED RAIL/MAGLEV
ASSOCIATION

March 26, 1993

The Honorable Bob Carr
Chairman
Transportation and Related Agencies Subcommittee
Committee on Appropriations
2358 Rayburn Bldg.
Washington, DC 20515

Dear Chairman Carr:

As promised during the March 15 hearing, I am submitting for your consideration a summary of subsidies to aviation.

For the record, this Association does not oppose subsidies to aviation. However, the testimony presented by Southwest Airlines Chairman Herbert D. Kelleher before your Committee on that date contained serious misrepresentations that cannot be left unchallenged.

With all due respect, it is impossible for the Congress to engage in a meaningful dialogue about eliminating the financial and institution impediments to a new form of transportation, high-speed rail, if the Congress is misled by Southwest Airlines about the public subsidies that it enjoys.

Mr. Kelleher made the false claim that U.S. commercial aviation is self-supporting through "user fees" such as the 10 percent Federal ticket tax, passenger facility charges, airport rental charges and concession fees, airport landing fees and state/local taxes.[1]

Before other audiences, Mr. Kelleher is even more emphatic, saying: "There is not a taxpayer dollar that goes into an

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[1] Testimony of Herbert D. Kelleher, Southwest Airlines, before the House Appropriations Committee, Subcommittee on Transportation and Related Agencies, March 15, 1993, pp. 10-11.

6616 Cypress Point Road, Alexandria, VA 22312 (703) 941-8927

airport ... Commercial aviation is not subsidized by any government whatsoever, state, local, whatever you might call it."[2] Reinforcing that myth is Southwest Airlines Vice President-Government Affairs Ron Ricks, who contends "commercial aviation is a self-supporting system" and "Southwest has maintained and in some cases expanded service ... without asking for or receiving any subsidy -- state or Federal."[3]

Those statements are false. First, a definition of the word "subsidize" -- "to aid or promote with public money." The word "subsidy" is a bit different -- "a grant by a government to assist an enterprise deemed advantageous to the public."[4]

Southwest Airlines benefits from bountiful subsidies in many forms -- but it is able to perpetuate the fiction that it does not. The reason is that most subsidies are indirect and hidden, not outright cash grants. Yet Southwest Airlines dividends would cease tomorrow if the company had to pay the full tab for its government-provided services.

The Federal government supports aviation through the FAA's air traffic control program, the Aviation Trust Fund, general subsidies in addition to that fund, taxpayer-funded research and development that benefits aviation conducted by the FAA, NASA and Defense Department, military training of pilots, guaranteed loans, and conversion of military airports to civilian airports. State and local governments also aid aviation. Following are the major categories and a discussion thereof:

1. Air Traffic Control: The Federal government provides the complex FAA air traffic control system and personnel -- the "traffic cops" of the skies. If Southwest Airlines were required to pay the cost of the air traffic control system, it would operate at a multi-billion-dollar loss. For example, in 1989, the Federal taxpayer paid $3 billion in general revenues toward air traffic control, about three times more than the combined net profit of the industry. Saying it another way, if Southwest Airlines had to pay its share of the costs for the air traffic control system (like high-speed rail will pay the full cost of

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[2] Herb Kelleher remarks before the Texas Good Roads Association, February 6, 1991.

[3] Statement of Ron Ricks, Southwest Airlines, undated, attached to letter from Herbert D. Kelleher, Chairman, Southwest Airlines, to members of the Texas House of Representatives.

[4] Webster's Ninth New Collegiate Dictionary, Merriam-Webster, Springfield, Massachusetts, 1990.

its train-control system), Southwest Airlines would probably not be profitable.

"The Federal Aviation Administration estimates that 85 percent of its expenditures are on behalf of private users and that the government and public interest share of its costs is 15 percent," said David Montgomery of the Congressional Budget Office.[5]

2. Aviation Trust Fund: The government reduces aviation infrastructure expenses and what would be horrible borrowing costs thanks to the aviation trust fund. This benefit, although collected through user fees, cannot be underestimated.

In Washington's fiscal year 1993 budget, the FAA budget will total $4.538 billion, only $2.799 billion of which will come from the trust fund.[6] That means that $1.739 billion will be subsidies from the general treasury. Other Federal expenditures for aviation have expanded from $6.4 billion in 1990 (only $3.7 billion of that in user fees) to $8.7 billion in 1993 (only $5.7 billion in user fees).[7]

In Texas alone, the stronghold for Southwest Airlines, the Federal government has allocated for the airport improvements more than $65 million last year alone, as follows:

Fiscal Year 1992	
First quarter	$ 9,290,023.00[8]
Second quarter	$31,635,748.00[9]
Third quarter	$18,336,158.00[10]
Fourth quarter	$ 5,769,829.00[11]
Texas Total:	$65,031,758.00

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[5] Statement before the Senate Committee on Appropriations, May 11, 1989, pp. 15-16.

[6] Senate-House Appropriations Conference Committee Report for Fiscal Year 1993, October, 1992, Washington, D.C.

[7] President's Budget for Fiscal Year 1993, p. 156.

[8] News Release, U.S. Department of Transportation, FAA 05-92, February 13, 1992.

[9] News Release, U.S. Department of Transportation, FAA 27-92, May 21, 1992.

[10] News Release, U.S. Department of Transportation, FAA 40-92, undated.

[11] News Release, U.S. Department of Transportation, FAA 57-92, December 2, 1992.

Southwest Airlines does not volunteer the fact that for decades no Aviation Trust Fund existed. Washington's subsidies to aviation all flowed from the general treasury. A 1977 government report stated that "Airport and airway development costs incurred prior to the assessment of user charges in 1971 have been treated as sunk costs, none of which have been or will be paid for by air carriers and other system users .... These sunk costs total $15.8 billion."[12]

Since the creation of the Aviation Trust Fund, the Congressional Budget Office (CBO) has estimated that private-sector users of the aviation system "have received a general fund subsidy of $17 billion," adding, "the general fund of the Treasury finances nearly half of total FAA spending for the aviation system."[13]

Southwest Airlines wants the Federal government to reduce the so-called "surplus" in the Aviation Trust Fund. W. David Montgomery of the CBO pointed out that arguments to reduce the balance are not well founded.[14] The surplus, said the CBO, is an illusion because "private-sector users of the aviation system, including airlines, have received more in capital and operating spending than they have paid in taxes."[15]

Taxpayer spending will continue. The Bush Administration admitted in 1990 that the Trust Fund income was inadequate to pay for aviation subsidies. In that year, the government collected only about $3.9 billion in aviation taxes. But total funding for aviation was $7.1 billion, far exceeding the taxes collected, according to DOT's then-assistant secretary for the budget, Kate L. Moore.[16] President Bush's budget that year called for a 14 percent increase in funding the FAA's day-to-day operations -- to a record $3.9 billion[17] -- and a 45 percent jump in funding for

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[12] "Federal Aid to Rail Transportation," Congressional Budget Office, January 1977.

[13] "The Status of the Airport and Airway Trust Fund," Congressional Budget Office, December 1988.

[14] W. David Montgomery, CBO, testimony to Senate Appropriations Committee, May 11, 1989, p. 13.

[15] Jim Tello, "Who Should Pay for the FAA's Operations -- and How Much?" *Travel Weekly*, Oct. 30, 1989, p. 22.

[16] DOT Letter to Editors, Jan. 26, 1990, "Airport and Airway...." enclosure, p. 1.

[17] The Budget for Fiscal Year 1990. P. 2-22.

FAA facilities and equipment. The agency became one of the fastest-growing accounts in the Federal budget.[18]

3. Essential Air Services Subsidy: The Federal government's general fund subsidizes the so-called Essential Air Service Program to allow flights to small towns that have a tiny trickle of customers. While such a program might be justified in remote Alaska, it is not elsewhere. For example, at Manitowoc, Wisconsin, an average of one person daily boards a flight. One fare is $89, but that traveler's trip is subsidized by $515, or an astounding 578.7 percent of the fare.[19] "The Essential Air Services program is one of the better pieces of pork-barrel legislation in Washington and, despite the deficit problem, few in Congress are likely to vote it out of business," said Kathryn B. Creedy, long-time Washington aviation expert and owner of Global Airline Enterprises.[20] This type of direct subsidy to airlines -- $25 million in 1989[21] -- is nothing new. It contributed to the decline in rail service all over the nation in prior decades.

4. Defense Research & Development: Taxpayers have paid for aviation research since World War I. A big boost came in World War II when Major General H. H. Arnold signed a U.S. Army contract with General Electric in 1941 for America's first jet engines.[22] The Department of Defense annually spends billions on research that brings priceless spin-off technology for commercial jetliners. Military programs continually develop costly technology that finds its way into commercial aircraft. Breakthroughs worth billions of dollars have included landing gear, complex cockpit and electronics systems, streamlined aerodynamic shapes, new metals and composite materials for wings, advanced gyroscopes, new fuels and engine combustion processes, fail-proof alert systems -- the list is endless. "Military aircraft continue to lead the way in developing advanced capabilities," wrote *Aviation Week's* Breck W. Henderson. Proving the point, Boeing's B-2 project manager, Dale G. Shellhorn, told *Aviation Week* that "We've made some very important advances in

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[18] "Highlights of the fiscal 1991 budget." *Washington Post*, Jan. 30, 1990, p. A8.

[19] Kathryn B. Creedy, "States, Not Washington, Must Develop Essential Air Services." *Aviation Week*, Sept. 25, 1989, p. 113.

[20] Creedy, p. 113.

[21] The Budget for Fiscal Year 1990, p. 5-88.

[22] News Release, "October 2, 1992, to Mark 50 Years of U.S. Jet Flight," GE Aircraft Engines, September 5, 1992.

aircraft technology that could be used for commercial aircraft. There is talk about making the entire tail section of the [Boeing] 777 from composites."[23]

5. Other Taxpayer-financed Research & Development: For several decades, FAA and NASA research has helped design air traffic control systems, engines, wings and components for commercial jetliners and turboprops. The aeronautical research and technology budget for NASA alone, which performs a substantial amount of work to improve commercial aircraft, was $505 million in 1991, an estimated $767 million in 1992 and a proposed $884 million in 1993.[24] Taxpayer-funded programs like this have brought about great improvements to aviation, improvements that Southwest Airlines does not finance.

6. Pilot Training: Taxpayers help aviation in a major indirect way -- the Federal government spends millions of dollars annually to train thousands of military pilots, many of whom shift to airline employment. Commercial pilots are trained by the Air Force, Navy, Marines or Army. "In 1988, 69 percent of the hires at major airlines were ex-military pilots," said Wendell H. Ford, chairman of the Senate aviation committee.[25] Government-financed training has been a windfall to the airlines, including, of course, Southwest Airlines.

7. Government-Guaranteed Loans: Washington even has issued subsidized loans to airlines buying new aircraft. In the 1960s the Civil Aeronautics Board guaranteed loans of as much as $5 million to buy aircraft for local air service.[26] A vestige of the program remained into the 1990s with "authority for the Secretary of Transportation to borrow funds from the Treasury to cover the costs of aircraft loan defaults."[27]

8. New tax-law changes Requested: This month, the airlines are asking the Clinton Administration to provide loan guarantees for jet purchases as well as an exemption from the proposed

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[23] Breck W. Henderson. "Boeing's B-2 Facility Produces Largest Composite Structural Parts Ever Made." *Aviation Week*, Sept. 17, 1990, p. 59.

[24] President's Budget for Fiscal Year 1993.

[25] James Ott. "Senate Hearing Focuses On Growing Pilot Shortage." *Aviation Week*, Aug. 14, 1989, p. 56.

[26] Senator Claiborne Pell, *Megalopolis Unbound* (Praeger), p. 167.

[27] Senate Appropriations Committee Report, 1989, p. 59.

increase in fuel taxes.[28] Last year, airlines asked the Bush Administration for new investment tax credits on the purchase of new aircraft. The Air Transport Association also wants changes in the alternative minimum tax.[29]

9. Mail Subsidies Established The Industry: Washington has been helping to shape aviation since 1920, when the U.S. Air Mail Service was started. When Congress passed the Air Mail Act on February 2, 1925, subsidies were established to pay air carriers for the cost of carrying mail -- costs that had outstripped mail revenues by a three-to-one margin (about a 400 percent higher dollar-for-dollar margin of subsidies than ever granted to Amtrak). Payments to airmail carriers exceeded estimated airmail revenue in 1929 by nearly $7 million -- an early subsidy.[30] But in 1930 Congress passed the Waters Act that provided aviation's pioneers with still more liberal compensation for carrying mail. By the 1930s, some airlines were receiving 70 percent of their revenues from heavily subsidized mail contracts.[31] Still more help from Washington came in 1938 when the Civil Aeronautics Act set up two new institutions -- an air traffic control service (based in part on towers taken over from private operators during the 1930s), and the Civil Aeronautics Board to undertake economic and safety regulation,[32] none of which was paid for by an aviation trust fund because such a fund did not exist until 1970.

Examples of State and Local Subsidies to Southwest Airlines

Texas also helps Southwest Airlines. According to Clay Wilkins of the Texas Aviation Department, the airline industry has been exempt from Texas sales and excise taxes. "We've made it easy for aviation development here," said Wilkins.[33] Texas routinely invests public funds annually on airports. "All the money for aviation development comes from the general fund," said Wilkins. "We have no aircraft licensing, no airport licensing, no air crew licensing, no aviation fuels tax."[34]

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[28] Martin Tolchin. "Clinton Considers Measures To Help Troubled Airlines," *New York Times*, March 22, 1993.

[29] Don Phillips, "Tough Issues Await DOT Nominee," *Washington Post*, January 23, 1992.

[30] "Subsidy and Subsidy-Effect Programs of the U.S. Government. Materials prepared for the Joint Economic Committee, March 31, 1965, p. 55.

[31] Joe Christy, *American Aviation*.

[32] "New Directions for the Nation's Public Works." Congressional Budget Office, September 1988, p. 55.

[33] Clay Wilkins, Texas Aviation Department, September 11, 1990.

Mr. Wilkins said airlines in Texas have been given "certain advantages in their certification process, and in particular the case of Southwest Airlines. They filed for their certification under the Texas Aeronautics Commission [which spent] several hundred hours bringing Southwest Airlines to the point of being able to serve, and even went to the Supreme Court of the United States to make sure that Southwest Airlines got that authority to serve Love Field .... I can't tell you how many hours of employee time and travel and this sort of thing that went into that process. There were hundreds and hundreds of hours of employee time that were spent during the hearing process, the regulatory process, to give them that authority. We got authorities for Southwest Airlines that would have been impossible probably if Texas had not taken a strong interest in that service between Houston and Dallas."[35]

Southwest's success is partially due to the taxpayers in that the Texas Aeronautics Commission went all the way to the U.S. Supreme Court to fight for the company's certificate. Southwest Airlines never reimbursed Texas taxpayers for these efforts.

What follows are just two examples of subsidies to Southwest Airlines at local levels.

Economic incentives offered by the city of Albuquerque and by New Mexico persuaded Southwest Airlines to locate a reservations center in Albuquerque. "The incentives include up to $6 million in industrial revenue bonds for construction and equipment purchases, a 20-year property tax exemption, a gross-receipts tax exemption on the purchase of equipment, and use of state job-training funds," reported the *Albuquerque Journal*.[36]

Further, when landbanking is done for future new airports or expansion of existing ones, local communities and the state government usually purchase needed property and hold it for future use. Since Texas is considering expansion of airport capacity, would Southwest Airlines like to go on the record and identify which thousands of acres of land near urban areas it is willing to purchase and hold onto (while paying property taxes) for 15 years or so?

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[34] Wilkins, September 11, 1990.

[35] Wilkins, September 11, 1990.

[36] Miller, Christopher. "City Gets Airline Reservation Center." *Albuquerque Journal*, August 29, 1992, p. A8.

Federal Subsidies Calculated

The late Warren T. Brookes, a Washington-based syndicated economics writer, calculated Federal subsidies over time. He wrote that in the decade of the 1980s, the FAA spent $44.5 billion for aviation projects, but the airlines and general aviation paid only $22.2 billion in taxes and user fees to the aviation trust fund. "The taxpayers paid the other $22.3 billion, slightly over half," wrote Brookes."[37] (Please see Appendix A.)

Officials of both parties have addressed subsidies. A former director of the California Department of Transportation, Adriana Gianturco, a Democrat, told Congress that "air travelers pay only one-third the cost of their transportation. If the U.S. were to remove its subsidies to the airlines, very quickly the airplane would be threatened as a means of travel."[38] Also, Bill Coleman, who was Republican President Ford's Transportation Secretary, said that if aviation infrastructure were not subsidized, the cost of a coast-to-coast air ticket would skyrocket.

Wrote Paul Stephen Dempsey, director of the University of Denver Transportation Law Program and airline expert: "We taxpayers financed the airports, paved the runways, built the air-traffic control towers and own the turbulent skies through which the airlines fly. The public's trillion-dollar, taxpayer-financed airport and airway system has been appropriated by airlines worth less than $15 billion, or 1.5 percent of the replacement value of the public system. Decisions on how public assets are consumed and which segments of the public are discriminated against are made by a handful of airlines CEOs, with no input from the public, which owns 98.5 percent of the system."[39]

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[37] Warren T. Brookes. "FAA May Have a Champion..." *San Francisco Chronicle*, May 10, 1989.

[38] Statement Regarding Proposed Cuts in Amtrak Service in California, May 11, 1978, p. 6.

[39] Paul Stephen Dempsey, "A year full of airline disasters," *Chicago Tribune*, December 30, 1991.

Aviation subsidies will probably grow. The American Association of State Highway and Transportation Officials (AASHTO), in looking at public spending for aviation between 1991 and 2000, concluded that $116.9 billion could be needed, although inflation "could well increase this figure."[40] AASHTO stated that their review was the first to combine all Federal aviation efforts in one document. The Congressional Budget Office issued a report agreeing with AASHTO and economist Brookes.[41] Putting it another way, the United States would spend more on aviation than *all European nations combined* would spend on their web of international high-speed trains.

The Congressional Budget Office, in a report issued last year, stated that "The Federal government continues to subsidize aviation from the general fund of the U.S. Treasury."[42] *The Economist* stated that "History aside, there is no longer any reason for the taxpayer to board every flight."[43]

All of this is only the tip of the iceberg. A look at the history of aviation provides startling findings.

Washington paid to develop airports over and over again. That started after World War II when many military airfields were declared surplus and turned over to local governments, with the Federal government's continued financial assistance, of course. Several legislative acts set up and perpetuated taxpayer support. Government subsidies for airport construction, maintenance and upgrading has totaled billions of dollars. "Beginning with the Federal Airport Act of 1946, the government has supported massive investment in the complex infrastructure essential to the operation of the airline industry. The Airport Act alone provided half of all capital spending on airports from 1946 through 1969," prior to the establishment of the Aviation Trust Fund.[44] Still today, "We are sort of a sugar daddy to provide Federal grants to stimulate the development of airports throughout the U.S.," said FAA official John Rodgers.[45] Another example of Federal largess can be found in New York, where LaGuardia Airport was built during the Great Depression by the WPA (Works Progress Administration).[46] A later example is in Orlando, Florida, where McCoy Air Force Base was converted to civil aviation use. Few vacationing families touching down on 12,000-foot parallel runways realize the facility was built for B-52s.[47] Pittsburgh's airport was built by the Federal government as a stop-over point for World War II planes and later conveyed to the community for civilian use.[48] Stewart International Airport in Newburgh, New York, made its transformation from an Air Force Base two decades ago.[49] A dozen other air bases are candidates for such conversion.

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[40] "Beyond the Horizon." pp. 116, 121.

[41] "Federal Aviation Subsidies: High, May Skyrocket." *NARP News*, February 1989, p. 2.

[42] "Paying for Highways, Airways, and Waterways: How Can Users Be Charged?" Congressional Budget Office, May 1992.

[43] "Absurdity in the air," *The Economist*, March 7, 1992.

[44] Bill Dwyer, "Airplanes Get a Lift," *Conscious Choice* magazine, July/August 1992, p. 33.

A Related Point -- Tax Exempt Bonds

High-speed rail planners are seeking a change in the IRS Code to exempt high-speed rail bonds from state volume cap limitations and put them on a par with tax-exempt airport bonds. Southwest Airlines has complained that this would amount to a "subsidy." Southwest Airlines is trying to lead the public to believe that tax-exempt airport bonds are "not a public subsidy" while the tax-exempt high-speed rail bonds "are a public subsidy."

What Southwest Airlines is saying is "Let's keep tax-exempt bonds for airports because they're good for us, but let's not let potential competition have the same instrument available." The *Wall Street Journal* reports that airports have floated $30 billion in bonds, which typically cover 75 percent of airport construction costs.[50]

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[45] "Official Describes FAA's Roles..." *Travel Weekly*, Jan. 25, 1990, p. 10.

[46] Laton McCartney, *Friends In High Places the Bechtel Story*, Ballantine Books, New York, 1988, pp. 62-63.

[47] "Joint Use and Conversion...." Partnership News, undated, p. 4.

[48] Barbara Klein, "A High-Tech Airport Promises to Fill Pittsburgh's Skies," *In Technology*, September/October 1992.

[49] Lori Sharn, "Military bases get new chance to fly." *USA Today*, May 23, 1990, p. 8A.

[50] Jonathan Dahl, *Wall Street Journal*, "Travel Is Off, Airlines Ailing, but Airports Just Keep Expanding, p. 1.

Contrary to Southwest Airlines' claims, such bonds are not repaid solely by air carriers. The typical revenue stream that repays bond holders comes from four sources. Two sources are financed by airlines -- aircraft landing fees and gate rentals. The other two sources are general concessions and automobile parking fees.[51] That last item can be the most profitable. At some airports, automobile parking fees are the single largest source of revenues.

Environmental groups like the Friends of the Earth, the Sierra Club, National Wildlife Federation and others support the bond amendment, as does the Public Securities Association. Former U.S. Senator Steve Symms (R-Idaho) pointed out that "The last major airport built in the United States was the $1 billion Dallas-Fort Worth Airport. That, like most airports before, was financed primarily with tax-exempt bonds. The next major airport is being built in Denver, for which nearly $3 billion in tax-exempt revenue bonds have already been sold. Neither of these projects -- both vital to the nation's modern transportation system -- would have been possible had the tax-exempt revenue bonds been limited by state bond caps. Further, airports are eligible to receive direct Federal support through the Federal Airport Construction Grant Program .... In other words, the current law creates an uneven playing field among differing modes of high-speed transportation."[52]

More precisely, it could be stated that the current *laws* create an uneven playing field among the various modes of transportation with high-speed rail at a distinct institutional disadvantage.

Conclusion

It is respectfully requested that you include this letter in the hearing record for March 15.

To repeat what was stated at the beginning of this letter, this Association does not oppose subsidies to aviation. We recognize that public support for aviation is vital to a healthy American economy.

It is regrettable that Southwest's Herb Kelleher objects so stringently to high-speed rail, but don't take our word for it.

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[51] Arthur Miller, Goldman, Sachs & Co., interview, November 12, 1992.

[52] *Congressional Record*, July 29, 1992, p. S10770.

Consider the view of Howard Putnam, Southwest Airlines former President, who stated that the airline's opposition is misguided and suggested cooperating with the train's planners. He told the *Dallas Morning News*, "That's what Southwest Airlines has been famous for: building things, growing things. I think that's one they have to be careful with. The consumer sees it as, 'Southwest is trying to deprive me of some high-speed, low-priced transportation.'"[53]

It is clear to transportation planners that proven rail technologies are not the issue. As outlined in our written testimony, high-speed rail can bring many public benefits to our nation. But to bring such programs to reality, we need to eliminate institutional and financing roadblocks.

The Federal government needs to put equity into the nation's transportation policies. We look forward to working with you to that end.

Thank you for considering these views. Should you find a need for more information about high-speed rail, we would be pleased to assist in any way possible.

Sincerely,

Joseph Vranich
President/CEO

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[53] Terry Maxon, "Herb Kelleher's Jet Set," *Dallas Life Magazine, Dallas Morning News*, January 12, 1992.

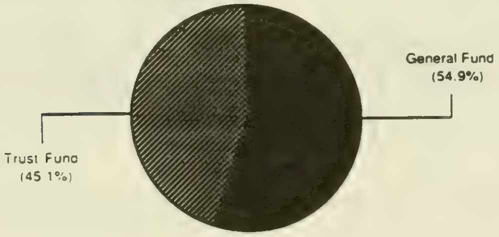
THE AVIATION INDUSTRY

Figures in billions of dollars

	Aviation taxes and user fees	Net general FAA spending	Taxpayer costs
1980	$1.874	$3.136	$1.262
1981	0.021	3.158	3.137
1982	0.133	3.134	3.001
1983	2.165	4.269	2.104
1984	2.499	4.651	2.152
1985	2.851	5.355	2.504
1986	2.736	4.872	2.136
1987	3.060	4.946	1.886
1988	3.189	5.191	2.002
1989	3.688	5.769	2.081
Total	$22.216	$44.481	$22.265

Source: Office of Management and Budget

Total FAA Outlays by Source, 1971-1988



Total: $54.9 billion

Taxpayers have paid through the general fund nearly $22.3 billion of the FAA's spending over a nine-year period and another $22.2 billion in user fee taxes, according to the Office of Management and Budget. Another study by the Congressional Budget Office concluded that, over a 17-year period, direct subsidies paid 54.9 percent of the FAA's costs. Not included in either study are massive government handouts through aircraft research and development, pilot training, state aid, municipal backing for bond financing packages, and other programs vital to aviation. *(Congressional Budget Office)*

FUNDING HIGH-SPEED RAIL OR MAGLEV

Mr. CARR. If you want to go back to the WPA, let's go back to the way the U.S. Government gave away land to the rails.

Mr. VRANICH. That is precisely my point.

Mr. CARR. They gave more than enough land to the rails to compensate them for doing it. I suppose if you wanted to go back far enough you could find out that Noah had a subsidy building the ark, but we are talking present day here. But I think in the present day environment, we are not looking to the past, we're looking to the present and we are looking toward the future. It's not in the jurisdiction of this committee, but Chairman Dingell was here, maybe he could consider it.

Maybe Mr. Rostenkowski and his committee could consider it, that somehow or other we find a funding source. I think that has been identified by the Transportation Research Board and others as to how we finance high-speed rail or maglev, other than in its research and development phases. Maybe we ought to wait until we mount the political courage to figure out what that financing mechanism is.

Mr. Claytor proposed a penny from the gas tax, which I could not find myself supporting. That is financial intermodalism. It would be helpful to have a surcharge on rail tickets, on freight weights or something like that, which would go into a fund, and then the Federal Government would target that fund in the same way we are going to have a national highway system.

GRADE CROSSINGS

Mr. CARR. Maybe we ought to have a national railway system of targeted main lines that are important to this Nation's economy. On those lines we will need signals and grade crossings and the like.

And I point this out because there is no one here from the rural areas of America. I would just pass on what I hear from my rural constituents, a few of which are on a high-speed corridor, designated by Andrew Card, the former Secretary. They would like to point out the cost of some of these grade crossing problems.

We heard testimony today about the liability questions and no matter how safe you try to make a grade crossing, people seem to fool with it and get themselves hurt. On the other hand, you have areas of the country that are rural and they already have tremendous travel times. If you close certain grade crossings, because you cannot possibly put a grade separation at every rail intersection in a road, you are adding to the cost of rural America's transportation as they have to try to circumnavigate a now-closed at grade crossing.

Maybe we ought to do some kind of research into systems that might prevent people from evading the protection that we seek to achieve when a train is going by. Because I see the rural community having some significant problems and it adds to their transportation costs, getting a milk truck to the city might well be more expensive if you cannot use the current grade crossings.

Mr. MEAD. I agree with that. That is a very important part. Apart from any high-speed rail issue, apart from that, tackling the grade crossing problem in this country ought to be a number one transportation priority. And it is not simply a rail issue. It is a surface transportation issue. I think it's properly attackable, if you will, with ISTEA, and that is the number one place where the rail industry has serious fatalities. It's the number one cause of death in the rail industry.

Mr. CARR. We have had a number in my district, and just recently. It's something that is a very difficult thing to cope with. We also have alignments of rail that while they might be handy for passenger use, are not particularly productive for freight use. We have these huge unit trains that go through the city of Lansing, fortunately at night, but every person who delivers emergency services in these towns around America worries about what happens on an EMS call or fire call at a time when the track is being used. Every State has a limit on how long they can block an intersection, but they are frequently violated and it reduces overall speeds on the trains.

Those are some of the problems. Fixing those would be in the billions of dollars, wouldn't it?

Mr. MEAD. Yes. I don't know about the billions but I wouldn't be surprised just in the Chicago-Detroit-St. Louis-Milwaukee run there are 1500 grade crossings. I'm sure that $5 million a year isn't going to fix a heck of a lot of them.

LOCOMOTIVE DEVELOPMENT TECHNOLOGY

Mr. CARR. We don't know what the administration is going to request, but if we were to begin attacking the rail speed/mobility problems, surface problems, conflict problems, we would be spending billions of dollars just to upgrade substantially the service we already have without trying to augment that much further.

Mr. Vranich, you heard Mr. Claytor's testimony about the development of locomotive technology and the time frames. Do you differ with what he said at all?

Mr. VRANICH. I'm not a real expert in that area, except to the degree that I did like when he was talking about lighter weight locomotive, one of the things that I have learned from interviews with British rail experts is that a diesel locomotive does as much damage to the track at 125 miles per hour as a lighter weight electric locomotive does at 150 miles per hour.

So I'm not mechanically inclined enough to comment on the specifics of the locomotives, which I heard light weight I was gratified and also as a former Amtrak press spokesman in the 1970s where heavy diesel locomotives experienced a rash of derailments, I'm just gratified to know that they are being more mindful of that weight-on-axles issue.

DEVELOPMENT OF NON-ELECTRIC HIGH-SPEED RAIL

Mr. CARR. But the development of this non-electric, high-speed power plant is several years away?

Mr. VRANICH. It would be beneficial for a number of routes. Not only the Empire Corridor, but the New York to Atlantic City route, the train comes down and stops on the main corridor and then all of this monkeying around occurs where people are rushing to and fro and one locomotive is going here and another is put on and it ties up the traffic for 15 minutes and the passengers aren't moving.

All of that could come to an end with this kind of locomotive. It is a real fast way to take something like a minutes out of the schedule. It is something that the Association certainly would endorse.

The time frame, I don't know what they are able to do in what time frame.

Mr. CARR. Do you have an opinion, Mr. Mead, about the time frames within which we can expect reliable 125-mile-an-hour, non-electric power?

Mr. MEAD. I think the 1997 date that Mr. Claytor, his associate quoted for you is a realistic one for the basic technology, but where are you going to run that train at 125 miles an hour is an important question.

You don't really have a plan before you with priorities for how much it is going to cost, so where will you run this train? That is one of the messages of our testimony today, is the committee faces hard decisions about where do you want to direct the money.

We are talking $4 billion just in the Northeast Corridor alone.

Mr. CARR. I understood from his testimony that the interest in that train would be as a connection or feeder to the Northeast Corridor. That was not the train that he was talking about or perhaps the Chicago-Milwaukee line.

Is that correct, anyone in the room?

Mr. GILLESPIE. It could be used in other corridors outside the northeast corridor. The design we are talking about is where the New York—

Mr. CARR. Something that intersects with perhaps the Atlantic City line. We are building on what we already have, although what we use may be in a different corridor someplace.

The question that we have to ask since we are being asked to invest money on these other corridors, not only Mr. Claytor's question about targeting one corridor and not trying to tackle all at one time, but trying to schedule the investment in relevant time frames; that is if we invest a lot on that unnamed targeted corridor, we might save money because we know it will cost more to do some of these things later.

On the other hand, if we do all of that today, that corridor may sit around underutilized, in terms of its speed potential, awaiting a power plant that won't arrive until the latter part of the decade. So we have to think about trying to get out ahead of ourselves here in the sense that we have a lot of other competing needs for the transportation dollar.

Mr. VRANICH. If I may follow up, I see other applications for that locomotive. It is a different issue, but Los Angeles has a ambitious plan to electrify all the rail lines coming into the city as one of their major pollution abatement efforts.

In that case, if there are regional trains operating like San Bernardino to Los Angeles, then this kind of locomotive starts making a lot of sense there.

In the high-speed arena, say, a public private-partnership is able to get something up and running like the Miami-Orlando-Tampa high-speed line, electrified trains are doing 150 to 170 miles an hour, but the interesting thing is we could do what the Spanish do. We could have this locomotive with a train leave Miami for Orlando running under electrical power and then go on to the existing railroad tracks to go to Jacksonville.

It is probably not justifiable from a traffic standpoint to include Jacksonville in a high-speed rail line at this time, but this kind of locomotive permits that kind of connectivity and permits a greater use of existing rail lines and a broader use of a newly built rail line.

Therefore, I see applications broader than the Northeast Corridor.

Mr. CARR. It would seem to me technically a tough one to achieve so that you could get the right speeds. It is nice to talk about dual mode, but it only operates in one mode at a time and while it is operating in that mode, it is paying the weight penalty of having to drag the other mode along doing nothing.

Mr. VRANICH. We have had FL9 locomotives operating in the Northeast Corridor since the thirties where they left New York City under electrical power and got to New Haven and jumped to diesel and continued the trip all the way up to Boston. So there is experience in dual locomotive.

I have ridden on trains like the French TGV. What I just described is electric and diesel, but I have also been on the TGV, which is equipped to operate under three different kinds of electrical systems and I have seen the engineer go through a short dead period and switches flip automatically and they go from one kind of an electrical power to another.

So there is engineering experience to bring these things about.

Mr. CARR. Well, we have learned a lot and the time is late. Thank you for your patience.

We will have additional questions for all of the witnesses. We will also put Mr. Salci's statement and other statements in the record.

QUESTIONS FOR MR. GRAHAM CLAYTOR

HIGH-SPEED RAIL DEFINITION

Mr. CARR. There is confusion in some circles about what constitutes "high speed rail". We hear about "high speed" rail, "very high speed" rail, and maglev. We know that Amtrak currently operates at speeds up to 125 miles per hour on the northeast corridor. Is that high speed rail or not? Perhaps you could give us some clear definitions, to set the stage for further discussion.

[The information follows:]

Amtrak considers its Northeast Corridor operations a high-speed rail operation. We are defining "high speed" as operations between 100 mph and 150 mph. Above 150 mph, Amtrak is calling this "ultra high speed."

Amtrak strongly endorses the incremental improvement approach to corridors that reduce overall trip time between major city markets. In many corridors, this can be most efficiently done by improving train speeds under 100 mph.

DIFFERENT MAXIMUM SPEED CAPABILITIES

Mr. **Carr.** What are the differences in maximum speed capability today among diesel, turbine, and electric locomotives?

[The information follows:]

Diesel locomotives today in the Amtrak fleet have a top speed of approximately 103 mph on straight level track. Under some instances, they can achieve slightly higher speeds. The prototype F69 AC Diesels have achieved 110 mph in testing at Pueblo and on the NEC. Amtrak expects the new General Electric diesel locos to achieve between 103 and 110 mph during testing at Pueblo Transportation Test Center.

The Turboliners in Empire Service have achieved a maximum speed of 120 mph in tests and generally operate at a maximum speed of 110 mph.

Electric locomotives of the AEM–7 class have attained test speeds of 135–138 mph and operate at 125 mph.

Amtrak believes the major element in defining speeds above 110 mph is a change in the mounting of the traction motors from axle hung to either truck frame or engine body mounted to reduce the unsprung mass. The AEM–7 has frame-mounted motors. The turboliner has a hydraulic drive with only the mechanical gear boxes on the axles, which is similar in performance to a body-mounted motor.

The new General Electric diesels have the potential to routinely achieve 110 mph, especially if lighter weight, three-phase AC Traction motors are installed in subsequent orders.

TURBINE-POWERED LOCOMOTIVES

Mr. **Carr.** I understand that turbine-powered locomotives have the potential to provide greater acceleration because of their greater horsepower-to-weight ratio. However, this comes at a price—higher operating and maintenance costs. Could you explain this technology to us more fully, so that we might understand its promise and its challenges?

[The information follows:]

It is true that the turbine power plant produces more horsepower per pound of deadweight than the typical low-speed diesel engine used in railway locomotives. However, the turbine is most efficient when operated at constant speed at substantial percent of its rated output. In railway operations, the turbine is often run lightly loaded when the train is operating at slower speeds or stopped in stations. Also, because the turbine is overhauled on the basis of operating hours, it often will be rebuilt twice as frequently as the railway diesel engine. In 1992, Amtrak compared the operating and maintenance costs of a conventional diesel electric locomotive with a hypothetical turbine-hydraulic locomotive and concluded the difference to be $3.62 per mile vs. a potential $6.56 per mile for a two locomotive, 8-car trainset. Based upon the British and Korean experiences, it is likely that a medium speed diesel engine could produce horsepower to weight ratios more comparable with the turbine at lower cost. Amtrak is committed, however, to exploring the potential that turbine power can offer and plans to support the New York State ISTEA Demonstration that will provide a fresh look at operating and maintenance costs of a modern modular turbine. We also believe that using a turbine electric drive, thus far only developed in one recent prototype by the French National Railroads in the mid-70's, can offer a means to improve the overall speed and load profile of the turbine in railway service.

All of our equipment suppliers are looking at medium-speed diesels, coupled with new electric drives and electronic controls, as a means to achieve better balance between performance and operating cost.

INTERCITY TRACK CHARACTERISTICS

Mr. **Carr.** On virtually every system in the world today with speeds exceeding about 120 MPH, concrete ties and continuous welded rail are standard track characteristics. With the exception of the northeast corridor, how much of our intercity track in the U.S. is built with concrete ties and CWR?

[The information follows:]

With the exception of the Northeast Corridor, very little of the intercity trackage that Amtrak operates over in the United States is built with concrete ties. A high percentage of the trackage over which Amtrak operates outside of the Northeast Corridor is laid with continuous welded rail. Of the 24,500 route miles, excluding the Northeast Corridor, the main tracks are predominantly laid with continuous weld rail.

FOREIGN HIGH-SPEED NON-ELECTRIC LOCOMOTIVES

Mr. CARR. High speed (i.e., over 125 MPH) non-electric locomotive exist today in Great Britain, Korea, and Thailand. Could any of those systems be implemented in the U.S. without further development work? If not, why not?

[The information follows:]

We are not aware of any non-electric operations operating "over 125 mph." The British and Korean solutions operate up to 125 mph.

The Great Britain and Thailand technologies are essentially identical based upon the 1976 British Rail HST. The Korean trainset is using the German MTU diesel hydraulic technology. We have been in further contact with the new owner of British Rail Engineering Limited, ABB Traction, about the use of this technology in the USA. ABB feels that there are much better solutions than early 1970's engineering, and to deploy the HST hardware in the USA at this time would be a step backward. Amtrak would concur with that conclusion. The next generation non-electric locomotive should incorporate the advances of microprocessor control and three phase alternating current traction motors. These technologies are the leading examples in the world of medium speed diesel power plants that could compete favorably with the turbine for acceleration and horsepower to weight ratios.

In both cases, the vehicle would have to be completely redesigned to meet the structural requirements of the Code of Federal Regulations.

DUAL POWERED LOCOMOTIVES

Mr. CARR. In fiscal year 1991, Congress appropriated $14 million for the development of dual powered locomotives. I know you've been trying to move this project forward for a long time, but have been unable to get responsive bids. Where does this stand today, and what are your future plans?

[The information follows:]

The formal solicitation has been concluded. Because we received no fully compliant and commercially acceptable proposals within the repeated attempts to solicit, we now intend to incorporate the non-electric, dual power locomotive program into the Northeast Corridor Trainset acquisition. This will enable the vendors to utilize much of the developmental cost of the trainset support systems and propulsion equipment of the electric locomotives in the non-electric locomotives. From informal discussions with many of the vendors, this appears to be a technologically sound course of action that could produce a high-speed locomotive by late 1995. Public notice to pre-qualify vendor for this program will be published in April, 1993.

In 1994, Amtrak will receive 10 dual-power diesel locomotives from General Electric for use in the Northeast to support operations into and out of New York City. These units will be capable of maximum speeds of 100–108 mph, depending upon train size and route profile.

NORTHEAST CORRIDOR TRAINSETS

Mr. CARR. Your fiscal year 1994 grant request includes $68.5 million for initial procurement of high speed trainsets for service on the northeast corridor. What types of trains are you considering, and would they have propulsion systems capable of operating on routes which are *not electrified?*

[The information follows:]

The Northeast Corridor Trainsets will be integrated units of approximately 300 passenger seats with a locomotive and driving cab car or two locomotives as necessary to achieve the New York to Boston trip time of less than three hours. As stated previously by incorporating the non-electric locomotive program into the same procurement, we achieve an ability to offer the same high performance equipment in other corridors of the United States by substituting the non-electric locomotive(s). The exact horsepower requirements of the non-electric locomotives should be tailored to the specific corridors where they will be deployed. The two prototype non-electric locomotives will be able to achieve speeds close to or exceeding 125 mph, depending on the physical features of the routes upon which they are deployed.

TILT TRAIN TECHNOLOGY

Mr. **Carr**. I rode the Swedish "X2000" tilt train between Washington and Baltimore recently, and enjoyed this ride very much. But it seems to me that since the main benefit of a tilting train is allowing higher speed through curves, then the X2000 may not provide the most cost-effective solution on routes with relatively few curves. Of course, the X2000 is an electric train, and we only have one electrified intercity route in the U.S. (the northeast corridor), which is very curvy over some segments. My question is, are the benefits of a tilt train such as the X2000 the same on straight routes as they are on curvy routes?

[The information follows:]

Your observations are quite logical and correct. The trip time savings resulting from tilting is a direct function of the amount of curvature and the sharpness of the curves. The X2000 tilting only functions at speeds above 40 mph, so routes with very sharp curves or steep grades would not result in appreciable trip time savings. Where the current speed limits are above 100 mph per hour, the X2000 can negotiate those curves at 120 to 135 mph, but the reduction is only six to twelve seconds a mile. On the New York-Washington route where curvature is not severe, raising the top speeds to 135 mph has produced greater time savings than the tilting technology. The greatest benefit from tilting technology comes in the 50 to 90 mph speed range which is more typical of the designated emerging corridors. Hence Amtrak is considering making it a requirement that its high-speed trainsets be designed for tilting apparatus, which will be deleted if it is not required for a specific route. We do not wish to have tilting added as an afterthought, but rather, to have it as part of the purchase package to enable the same basic equipment to be applied nationwide with minimal development cost.

EUROPEAN TECHNOLOGY

Mr. **Carr**. The X2000 is not the only train in service worldwide which could theoretically compete for Amtrak's high speed train requirement. Do you plan to evaluate other European trains also?

[The information follows:]

We are currently negotiating with the German consortium responsible for the manufacture of the InterCity Express (ICE) to bring that trainset to the United States during the second half of 1993. As with the X2000, this will be largely a marketing test of the passenger comfort and food service aboard to generate ridership data on the type of train interior and service the American traveler would appreciate. The ICE, with its two locomotives, can produce horsepower per ton ratios nearly 60% higher than the X2000. This will allow us to gauge schedule performance using higher rates of acceleration to offset the lack of tilting.

The European technology is currently licensed in the United States to numerous US and US subsidiaries of European companies. The Northeast Corridor trainset solicitation will not purchase any one European country's train, but rather will enable European suppliers as well as US suppliers to design and assemble the American trainset that incorporates proven technology.

Mr. **Carr**. Currently in the U.S., crash production requirements of passenger coaches (called "buff strength") are more stringent than in Europe. (They are almost twice as rigorous). If we are to import European technology, will we have to either make the U.S. standard more lenient or upgrade the existing equipment to be more crashworthy?

[The information follows:]

Amtrak will procure only equipment that meets all the requirements of the Code of Federal Regulations. The "buff strength" requirement is also contained in the Interchange Rules of the Association of American Railroads, which we feel is prudent to follow to enable the trainsets to operate upon the tracks of the freight railroads. While we may be importing technology, we are not importing a train. Our trainsets will be designed for America with majority domestic content and final assembly in the United States as required by law.

HIGH-SPEED RAIL COSTS

Mr. CARR. Some studies have indicated that operating and maintenance costs are greater for high speed rail systems than for lower speed systems, because energy and track maintenance costs increase as a function of speed. Is this accurate?

[The information follows:]

Generally, this answer would be "yes." It takes more energy to move the same equipment at a higher speed, and the same equipment moving at a higher speed will have higher impacts and more rapid wear of the track components. However, better designed and more streamlined equipment, such as the X2000, can operate at a higher speed and use less electrical energy than our present equipment. The self-steering trucks of this equipment also reduce the lateral forces put into the track structure.

Mr. CARR. OTA reached the following conclusion in their 1983 study: "The irony of the land use issue is that high speed rail promises to be most successful in corridors where there are many people to ride it, yet these very same densities make the establishment of new high speed rail lines exceedingly difficult and costly."

Why would costs be higher in those areas with the greatest ridership potential, and to what extent will this be a problem for the development of high speed rail in this country?

[The information follows:]

Constructing a new, dedicated high-speed railroad on a new right-of-way through high density urban areas could be difficult because of the limited availability of land, high land cost and environmental concerns. While Amtrak would prefer to operate entirely new state-of-the-art corridors like the French TGV, in view of the costs, it is looking first at the feasibility of upgrading existing railroad rights-of-way typically owned by freight railroads or state and local government agencies. The capital cost of improving an existing right-of-way is far less than the cost of constructing a new railroad because it reduces the need to acquire significant real estate. It also simplifies environmental impact studies. In addition, the Intermodal Surface Transportation Efficiency Act has changed the transportation planning process, and hopefully local priorities, since it requires an integration of the different modes to promote overall transportation efficiency.

Mr. CARR. In 1992, Amtrak's national average cost was approximately 33 cents per passenger mile, excluding commuter operations. To what extent would these costs be lower under high speed rail systems, and why would they be lower?

[The information follows:]

While Amtrak's total cost per passenger mile was approximately 33 cents for fiscal 1992, a better measure of cost performance is obtained using long-term avoidable cost rather than total cost. Long-term avoidable costs are those expenses which can be directly attributed to the operation of a particular route or service and do not include arbitrary allocations of items such as interest, depreciation, and various corporate overheads. For FY 1992, Amtrak's long-term avoidable cost per passenger mile was approximately 17 cents for the combination of all services except commuter.

With the introduction of high-speed service, long-term avoidable costs would be unaffected by the capital investment required (since interest and depreciation are excluded), but would likely increase as a result of the higher operating costs for maintaining advanced technology equipment and high-speed rights-of-way. However, this increase would be somewhat offset by operating crew cost savings due to reduced running times. Additional passenger miles generated by increased ridership are expected to produce a reduction in long-term avoidable cost per passenger mile, with the potential to reduce, and possibly eliminate, long-term losses currently being incurred.

USE OF HIGHWAY TRUST FUND

Mr. CARR. Mr. Claytor, in your statement, you list several cost elements which pose financial obstacles to the development of high speed rail. These include the elimination of highway grade crossings, signal improvements and automatic train control systems, additional trackage, and rail line upgrades. As a practical matter, do you think we'll have to use the Highway Trust Fund to finance these kinds of activities if high speed rail is to be successful?

[The information follows:]

The infrastructure improvement costs for each corridor will be unique to that corridor and will depend on a great many different factors such as, quality of existing track and bridge structures; curvature; signal and train control systems; number of tracks, interlockings, and grade crossings; volume and nature of existing freight and passenger traffic, etc. While it is not practical to reach generalized conclusions without detailed studies, based on our own experience in the Northeast and several state sponsored studies, the total costs for the combined corridors would be in the billions of dollars.

Difficulties encountered in California, Florida, and Texas have demonstrated that public financial support is necessary for high-speed rail development, as private investors are unwilling to commit funds to rail projects with long recovery periods. In 1992, Representative Al Swift introduced a bill that would have established an intercity rail passenger trust fund financed with a penny of the federal fuel tax currently allocated to deficit reduction. This proposal would provide both for Amtrak's systemwide capital needs and some federal investment that is essential for high-speed rail development. Together with state, local and private matching funds, the penny reallocation would provide a means to progressively implement these high-speed corridors.

The use of the Highway Trust Fund would also be appropriate for certain of these investments. The separation or elimination of grade crossings provides significant benefits to highway users in the form of greater safety, reduced delays and a smoother ride at crossings. Also high-speed stations should be designed as intermodal facilities rather than as purely railroad facilities. The provision of parking, taxi and local and intercity bus facilities would be beneficial to highway users, as would the diversion of some travel from congested highways to rail. We think that these benefits to highway users should be considered in formulating a national strategy for financing the development of high speed rail in the United States as it has been developed in Western Europe and the Far East.

BENEFITS

Mr. CARR. One of the primary benefits postulated for high speed rail systems is a reduction in congestion on our highways and at our airports. However, a 1983 OTA study concluded the following:

> There is little evidence provided to indicate that it [high speed rail] will significantly affect highway and airport congestion. The former generally is caused by commuter and other urban area access traffic rather than intercity traffic . . . airports that now have or are soon to have severe congestion results from passenger flight transfers. High speed rail would not alleviate this.

What is your view of this finding?

[The information follows:]

We believe that the (ten year old) study may have underestimated the significance of intercity auto travel to overall highway congestion. Traffic through and around many key urban areas eligible for high speed rail becomes much more congested than normal on weekends and holiday travel peaks because of the intercity auto component. Much of this traffic could be redirected to an attractive high speed rail system. Since reduction of as little as 5–10% of traffic volume results in a greater than proportional improvement in traffic flow, we could reasonably expect measurable congestion relief from a successful high speed rail system.

With regard to airport congestion, we feel even more strongly that OTA underestimated the impact of capturing short distance trips. Although much of airport congestion and capacity problems do result from hubbing and passenger transfers, there is nonetheless substantial local short distance traffic transferable to a competitive rail service in such areas as the Northeast Corridor, Chicago Hub, Northern and Southern California, etc.

For instance, Coalition of Northeastern Governors has noted the Boston Logan Airport as having nearly 25% of its slot capacity devoted to traffic to/from the New York metropolitan area, and hence readily divertable, at least in part, to an improved rail system.

It is equally believed that a high speed Midwest rail network, hubbed at Chicago, with routes to three or more end points, would capture commuter air traffic to several intermediate cities and regular air service to the endpoints, thereby providing worthwhile capacity relief to overcrowding at O'Hare Airport. A similar improvement could be expected at both San Francisco International and Los Angeles International airports in California, given sufficient frequency and speed in short distance rail corridors.

HIGH SPEED RAIL VS. AIRLINE HUB-AND-SPOKE SYSTEM

Mr. CARR. As OTA points out, high speed rail works best when there is a high volume of origin-destination (O&D) traffic along a corridor. This is very different from the current hub-and-spoke pattern of domestic air routes, which offer economies of scale for airline operations and wide service options for air travelers. How would high speed rail systems be able to compete operationally against the hub-and-spoke system?

[The information follows:]

The airline hub-and-spoke system is primarily used for long distance trips. For shorter distance trips, this system often diverts passengers several hundred miles out of their way, and adds unnecessary travel time to what would otherwise be a short direct flight. As envisioned by Amtrak, high speed rail systems would primarily be used for shorter distance trips, in which point-to-point running times would not exceed three to five hours. High speed rail would carry passengers directly between their desired points of travel with air-competitive trip times, reducing the need for short flights and freeing up gate space at congested airports such as Boston's Logan or Chicago's O'Hare. This would permit airlines to focus their resources on the longer distance trips that they are more efficient at operating.

ENERGY CONSUMPTION BENEFITS

Mr. CARR. Another frequently-mentioned benefit is reduction in energy consumption. In 1981, the DOT and Amtrak conducted a study to determine whether train ridership would increase if gas prices rose significantly and train service (including speed) improved. DOT concluded that, even though ridership would increase somewhat under those scenarios, "energy impacts of rail corridor development are at best insignificant". In 1983, OTA echoed this conclusion in stating that "any significant energy savings are likely to occur only if substantial displacement of automobile use occurs". Are these conclusions valid today, and if not, what has transpired over the past ten years to change that assertion?

[The information follows:]

In 1988, the average number of passenger miles carried per gallon of fuel for automobiles was 34, and the best case automobile passenger miles per gallon of fuel was 80. A five car, single-level Amtrak train traveling at 80 miles per hour can carry 292 passenger miles per gallon of fuel, and an eight car, single-level Amtrak train traveling at 80 miles per hour can carry 335 passenger miles per gallon of fuel. Therefore, due to the greater fuel efficiency of the passenger train over the private automobile, energy savings will occur if there is displacement of automobile use.

ECONOMICS AND RIDERSHIP ISSUES

Mr. **Carr.** French data as shown on the following chart indicate that the cost competitiveness of high speed rail drops dramatically when motor vehicles have more than one person traveling in a car. If this rail advantage shrinks in France, where gasoline costs $5 a gallon, it would shrink or disappear altogether under conditions of gasoline prices less than $5 a gallon. In the U.S., the typical automobile load factor for intercity trips is 1.6 passengers per vehicle, which means that only 40 percent of automobile riders travel alone. Can we realistically expect high speed rail to compete economically against the automobile, gasoline prices were higher?

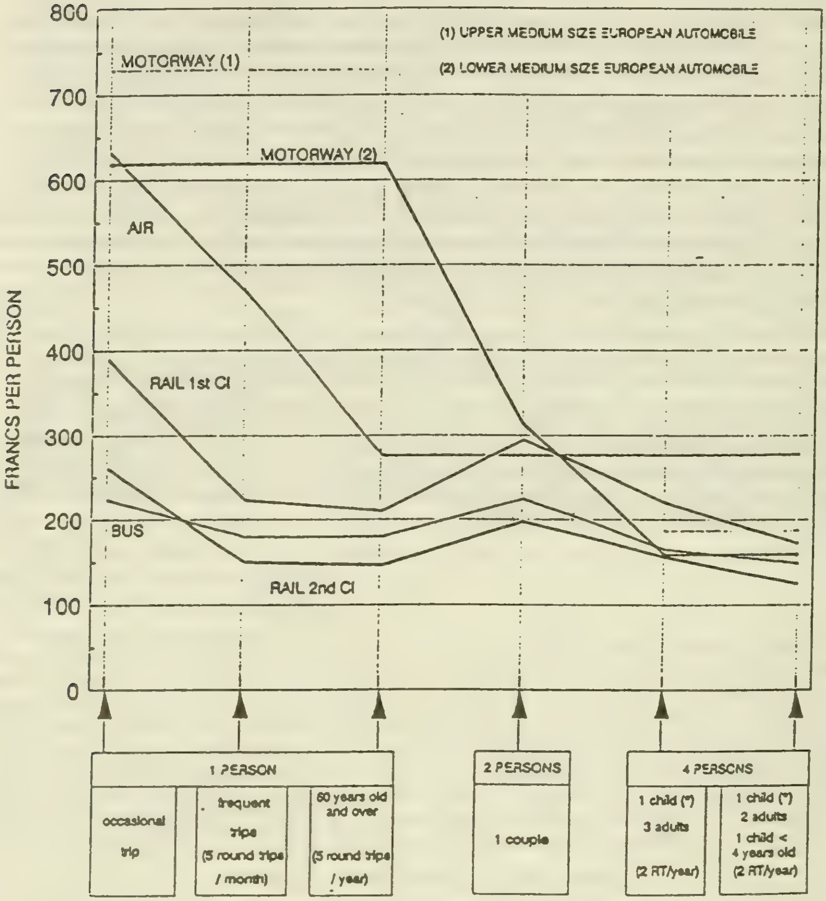
[The information and chart follows:]

Fuel cost is only one factor driving the demand for high-speed rail and plays a more important role for autos with one occupant. These single occupant vehicles account for a significant number of autos on heavily travelled corridors and are a great potential source for ridership diversion to rail. In addition to fuel cost, other economic factors impact the demand for high-speed rail, including the cost of tolls and expense of parking within city centers. Non-economic factors, such as comfort and the potential to better use travel time, also make rail a more attractive mode. Finally, high speed rail provides an important transportation alternative to the many travelers who do not own an auto.

PARIS - BORDEAUX

TRANSPORTATION COSTS PER PERSON
(for different group sizes and transportation modes)

Prices - year 89



(*) with a "KWI" reduction card

OGV/BCRANVE.DRW

TRANSIT "FEEDER" NETWORKS

Mr. **Carr.** Where high speed rail systems are most successful around the world, you generally find good transit "feeder" systems to move traffic into, and out of, the rail network. While that is basically true in the northeastern part of the U.S., it is generally not true in other parts of the country. In your view, how important is the existence of transit "feeder" networks for the successful implementation of high speed rail?

[The information follows:]

Although the existence of transit "feeder" networks are important in bringing people to and from the rail network, the lack of a transit system can be compensated with suburban station stops on the rail line (such as Route 128 [Boston], Metropark [Iselin, NJ] and New Carrollton, MD), as well as adequate parking at these station stops.

TOTAL TRIP TIME CONCEPT

Mr. **Carr.** Many studies have shown that what matters most to the intercity traveler is not the speed of the main transportation vehicle, but *total trip time.* While important, the speed of the main mode cannot be considered separate from the access and service times associated with that mode. Even if the train itself can travel faster than an automobile, if the extra time requirements for traveling by rail (such as transit to and from the station, wait time, and boarding intervals) are large, they can raise the total trip time over that of the automobile. Do you agree that all of these factors need to be considered when evaluating the feasibility of a particular high speed rail route?

[The information follows:]

We not only agree but are fully aware of the total trip time concept. Several demand studies performed for Amtrak and FRA by recognized consultants over the last few years have been meticulous in their analysis of all components of trip time and the need for rail to compete on a total time basis.

It is fortunate that rail already has a significant advantage at the typical trip destination end for downtown convenience. Most rail corridors provide convenient center city locations with frequent, inexpensive local transportation available. This is one of the key reasons for present rail service being chosen over air for many trips (e.g., downtown New York vs. airport locations).

Rail also has quick ticketing/access/boarding characteristics which allow passengers to arrive at the station significantly closer to departure time than would be possible at an airport (requirement to check baggage; security procedures; minimum check in time to not lose reservation; etc.) There are two important additional non-quantifiable advantages for rail. The access and line haul are less stressful (security/safety/en route mobility). Also, the line haul travel time is a larger portion of the total, providing a larger percent of usable time for work or relaxation.

Since the other components are already advantageous, the single element most in need of improvement to make rail competitive is line haul speed. Line speed is also the element we are most able to improve. Rail should become more competitive and economically viable when its total trip time is able to compete effectively with both auto and (selectively) air for appropriate trip lengths. We must therefore achieve a speed level fast enough on the line link such that the combined trip is perceived as fully competitive.

Mr. **Carr.** Air travel demand has declined when compared to the forecasts of only a few years ago, and most analysts believe that much of the most profitable segment of the market—business travel—will not reappear to earlier levels due to middle management streamlining and administrative efficiencies. To what extent does this drop in the intercity travel market affect the economic prospects for high speed rail?

[Amtrak response follows:]

Air travel forecasts have historically been inflated as they typically assume unlimited growth potential. But recently, as the market has matured, ridership growth has begun to level off. This has resulted in the failure to meet inflated projections; however, it is not an indication as to the prospects for high-speed rail service.

Currently, rail service accounts for 43 percent of the total air/rail travel market between New York and Washington, due in part to the ease of travel to/from city centers. High-speed rail in other parts of the country can be expected to divert even more ridership from both the air and auto markets, because of rail's increased competitiveness, comfort, and convenience.

Mr. Carr. We have seen cutthroat competition over the past couple of years in the domestic airline industry. Fares have been offered which were not enough for the airlines to cover their operating costs.

With an important U.S. industry flat on its back and route competition at high levels, why should we use federal funding to assist in development of a competitor to those airlines—high speed rail?

[Amtrak response follows:]

High speed rail offers many economic and societal benefits in addition to fast, reliable short distance transportation. On appropriate corridors, high speed rail should be able to provide total end point trip times equal to or better than the air system, when airport access, egress and security check in times are counted. This is especially true for Central Business District destinations where the train may provide walking or a very short local transit trip to ultimate destination. Therefore, there will be a net societal time savings to the user. The rail trip also provides more continuous, relaxing and potentially productive use of time since most of the trip is in one vehicle, rather than a sequence of several disconnected segments: access, check in, security, waiting, flying, and all the reverse at arrival.

Rail service is more reliable than air because it is much less likely to be delayed or cancelled due to weather conditions that often plague air operations. High speed rail is also substantially more fuel efficient than air for short distance routes. With electrification, it offers the possible benefit of not consuming fossil fuels at all. Thus, high speed rail investment could help reduce our fuel dependency and ultimately balance the trade. Finally, high speed rail is quieter than air at airports and less polluting than autos whose trips it could replace.

High speed rail may also provide land use benefits in crowded metropolitan areas. Many of the airports serving key potential rail corridor cities (all NEC airports; Chicago O'Hare; California Los Angeles and San Francisco International; etc) are now at or above reasonable capacity limits. They face the likely need to either expand at the existing site or even require totally new sites. The redeployment of freed up take off/landing slots to more efficient longer distance air routes that could result from high speed rail demand relief, might free up capacity to obviate the need for undesirable land takings.

Mr. Carr. What would stop the airlines from engaging in discount pricing practices, which would be an expected response on their part to prevent high speed rail systems from diverting air travelers?

[Amtrak response follows:]

Amtrak believes that, with the exception of a few regionally-oriented airlines, the focus of most airlines is not on short distance trips such as those that would be served by high speed rail systems, but on longer distance trips that they can serve far more effectively with their hub-and-spoke systems. As a result, fare discounting may not be as large a factor as would otherwise be anticipated.

Certain airlines, however, may choose to engage in the price cutting that has been a major source of the airline industry's woes. In that case, we believe high speed rail systems offer several unique advantages which would offset the diversionary effect of fare wars.

Amtrak would not envision initiating high speed service in any area where downtown to downtown travel times would not be competitive with air trips.

We would anticipate that many travellers would prefer not to fly if another time-competitive mode were offered. High speed rail accommodations are roomier, more comfortable, allow passengers to move about freely during the course of the trip, and have ample room for working while traveling.

High speed rail would serve many markets that are presently under-served by the airlines. Examples of such markets in the Northeast Corridor include Philadelphia-New York/Boston/Washington, Baltimore-New Haven/Providence, Wilmington-Boston/Washington, etc.

POTENTIAL CORRIDORS FOR HIGH-SPEED RAIL

Mr. CARR. Outside of the northeast corridor, what intercity corridors in this U.S. offer the highest potential to cover the recurring O&M costs of a high speed rail system, and why?

[Amtrak response follows:]

Outside of the Northeast Corridor, Amtrak believes the following corridors hold the most potential to support viable high speed rail systems.

Empire Corridor: New York–Albany.
Texas High Speed Corridor: Dallas–San Antonio–Houston.
Florida High Speed Corridor: Tampa–Orlando–Miami.
Virginia High Speed Corridor: Washington–Richmond–Newport News.
Chicago–Milwaukee.
Chicago–St. Louis.
Chicago–Detroit.
California High Speed Corridor: San Diego–Los Angeles–Oakland–Sacramento.
(Vancouver, BC)–Seattle–Portland.

The corridors listed above have several characteristics in common. First, they serve cities of sufficient population density to provide a ridership base. Second, the distances between endpoints are sufficiently short as to permit air-competitive travel times.

We believe the combination of these attributes will generate sufficient ridership and revenue to allow high speed rail services in these markets to cover their recurring operating and maintenance costs.

QUESTIONS FOR MR. KELLEHER

"TEXAS TRIANGLE" FARES

Mr. CARR. Mr. Kelleher, what is the average price today of Southwest Airlines' tickets in those cities covered by the Texas TGV project, and why are you skeptical that rail transportation could not offer competitive or lower fares?

[Southwest Airlines response follows:]

For the calendar year 1992, our average fares in the "Texas Triangle" markets (exclusive of the federal excise ticket tax) were as follows:

a. Austin—Dallas: $53.87.
b. Austin—Houston: $55.36.
c. Dallas—Houston: $52.47.
d. Dallas—San Antonio: $47.67.
e. Houston—San Antonio $50.28.
Combined Texas Triangle Average Fare: $51.84.

With our cost structure, Southwest Airlines is profitable at these fares. From the evidence produced at the hearing before the Texas High Speed Rail Authority, however, it is clear that the fully allocated costs of the TGV train project are so high that it could not cover even its costs, much less produce profits, at these same fares. An excerpt from an April, 1993 *Texas Monthly* magazine article on the proposed TGV project follows on the subject of TGV costs.

With respect to TGV's ridership estimates, it is also important to note that our fares could be reduced in order to remain competitive with even a subsidized TGV entity. TGV's ridership estimates are predicated on *undercutting* Southwest's fares.

BEFORE TEXAS TGV CAN TAKE anything from anybody, it must find investors. Although the major participants—Morrison Knudsen, GEC Alsthom, and Bombardier—are paying for the operation of the High-Speed Rail Authority (the use of state funds is prohibited by law) and for an environmental study that is badly overbudget, the big bucks will ultimately be other people's money. Even the initial equity of $167 million will largely come from borrowed funds.

The debt payments will be crushing: $788 million a year starting in 2003. Add to that annual operating costs in the neighborhood of $200 million a year, and the bullet train will require around $1 billion a year in revenues just to turn a profit—ten times what Southwest Airlines now grosses from local passengers on the same routes. Based on Texas TGV's financing plan, here is what must occur in order for TGV to make money:

- American Airlines must cancel all flights from Houston, San Antonio, and Austin to DFW Airport and contract with Texas TGV to bring passengers by train. The ridership projections are absolutely dependent upon this contingency. It is not totally farfetched, since most airlines, Southwest being the exception, don't make money on short-haul flights. The only trouble is that American's chairman, Robert Crandall, is on record as doubting that the bullet train can attract enough passengers to be profitable.
- Congress must remove limitations on issuing tax-exempt bonds for high-speed rail projects. But Congress refused to do so just last year. Maybe the Clinton administration can persuade them.
- The market for Dallas–Houston and Dallas–San Antonio travel must grow by 35 percent between 1991 and 2001. The bullet train must capture more than half of that market, including automobile travel.
- It must find investors willing to bet on a project that requires massive refinancing and 19 to 23 years to make a profit. (This is the estimate of Harriett Stanley of the Massachusetts-based Hadley Group, financial consultants to the High-Speed Rail Authority.)
- Finally—and these are my calculations, not Texas TGV's—the bullet train needs close to a 100 percent occupancy rate year-round to make money. (With 34 round trips a day on two lines and a capacity of 317 passengers per train, an average fare of $70 would generate a maximum of $1.1 billion a year.)

TEXAS TGV

Mr. CARR. Your statement says that comparisons between the TGV in France and a possible TGV implementation in the U.S. do not take into account relatively weaker air service in France and higher air fares (compared to U.S.). Could you explain this to us in more detail?

[Southwest Airlines response follows:]

It is well known (as observed by several independent consultants cited in our written testimony) that French shorthaul travellers have less frequent air service and the fares are higher. We have learned by experience that in *shorthaul* markets, schedule frequency, total elapsed travel time, and price are the determining factors. Service amenities such as meals, first class seating configurations, entertainment and the like play almost no role whatsoever in the purchase decision. Shorthaul travel is a distinct market with totally different characteristics from longhaul travel.

For instance, when we acquired our former subsidiary, Muse Air, it was charging a $10.00 premium for first class service in shorthaul markets but virtually nobody purchased first class seats in those markets. Customers did, however, regularly pay a $20.00 premium for first class seats in such longhaul markets as Houston-Los Angeles.

In the Texas Triangle, consumers have the choice of going by air, which even the train proponents admit is much faster. For many consumers, the airports are more conveniently located and easier to reach than downtown train stations, so the total elapsed travel time factor gives air even a greater edge. Southwest Airlines' schedule frequency (*eg.*, every 30 minutes in the Houston—Dallas market) is outstanding. As the answer to No. 1 above indicates, the fares are extraordinarily low. Conclusion: rail will not be an effective shorthaul competitor when it cannot equal or exceed the performance of air transportation in those categories of performance most important to the Customer. In France, consumers do not have an option. There is no high frequency, low fare air carrier to compete with the TGV.

Mr. CARR. You state the subsidies for the TGV would range from $13 to $187 per passenger. From where did you get this data?

[Southwest Airlines response follows:]

Transportation Research Board, National Research Council. "In Pursuit of Speed." November, 1991 at pgs. 4–15, 4–16 and Table 4–5.

MARKET CHARACTERISTICS

Mr. CARR. Mr. Kelleher, you run a successful business providing shorthaul transportation in the same *mileage range* postulated for high speed rail. From this experience, can you give us your opinion of the *market characteristics* necessary to result in efficient and cost-effective service for that transportation market segment?

[Southwest Airlines response follows:]

This is a very difficult question to answer briefly. However, looking at the Texas Triangle markets, it helps to have:

a. large population centers with an affinity of commercial and other interests;

b. airports, airspace, and operating systems which permit efficient utilization of assets;

c. reasonable facility (ie, airport) costs which permit a low cost structure, which in turn begets the low fares essential for inducing incremental travel and further induces Customers to fly instead of drive.

IMPACT ON CONGESTION

Mr. CARR. Wouldn't high speed rail offer reductions in airport and highway congestion, and consume less energy, than alternate forms of intercity transportation?

[Southwest Airlines response follows:]

Assuming congestion existed, it would not be alleviated if the train service did not attract sufficient riders to have an impact. Given the option of faster, frequent, low fare air service, Customers would not flock to rail as its proponents dream. Further, airport congestion is not a problem for Southwest in its Texas Triangle markets, nor does *intercity* highway congestion exist. The congestion is *intracity,* where rail would have no impact. With respect to energy consumption, the train would use electricity produced by lignite coal burning plants, but we do not know enough about the energy consumption of the TGV to answer the question. TGV's overall adverse environmental impact is, however, rather prodigious. For example, it is interesting to note that the Airbus Consortium in Toulouse, France says in the following piece that the TGV is much louder than a stage 3 airplane.

AIRBUS INDUSTRIE

MARKET PERSPECTIVES
FOR
CIVIL JET AIRCRAFT

[illegible]-P 312 [illegible] 1 93

February 1993

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Epilogue

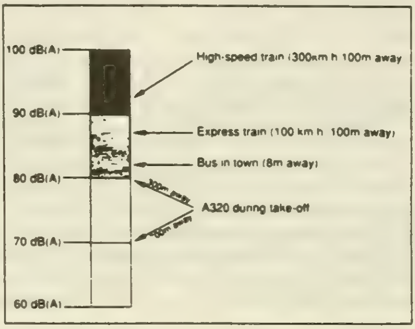
Hushkit : the risky option

Current noise regulations allow certain trade-offs to achieve Stage III certification by not meeting one or two of the three limits (take-off, approach, sideline). Moves to increase the severity of noise standards are being considered. New rules will certainly evolve to abolish the use of trade -offs to comply with Stage III. Most hushkit concepts require the use of this trade-off clause which allows Stage III compliance by not quite meeting one or two of the three limits.

The major source of noise from a low-bypass engine is the exhaust jet. By mixing engine gas and fan airflow within the confines of the engine, high-bypass turbofans can reduce jet exhaust velocity by 50%. A twofold increase of the jet velocity means a 20db increase in noise level. A hushkit falls about 5 EPNdB short of filling the gap between a Stage II and a modern turbofan-powered aircraft. This means that hushkitted aircraft will be the noisiest Stage III aircraft, and any new regulation which suppresses the trade-off clause will make hushkitted aircraft non-compliant.

Hushkits are on offer for the majority of Stage II aircraft. Flight tests have shown that, in general, hushkits allow compliance with Stage III noise requirements, but at the expense of performance. For a typical twin-engined aircraft the weight increases by some 1300 lb and take-off field length increases by 1.2%. Fuel burn on a typical 500 nm sector is 6.5% higher than on an unmodified aircraft. Along with modification cost and heavy maintenance expenditures the final bill for noise compliance can amount to $5 million depending on the aircraft.After all, hushkits do not address the problem of engine emissions which remains the prime area of environmental concern. Therefore, any move to tighten current regulations will jeopardise the airlines' costly investment in hushkitting old aircraft, especially since the price of the aircraft could exceed the market value in a very depressed secondhand market.

Noise comparison



Commercial aviation is the least noisy mode of transport. For instance, the noise level of an A320 measured at 300 m distance, which is typically equivalent to the distance between the aircraft and the airport boundary, is 80dB(A). A 300km/h high-speed train 100m away from the nearest housing produces a 93 dB(A) noise level. Train technology in recent years has permitted considerable increases in running speed; this has inevitably been accompanied by a substantial increase in aerodynamic noise.

]

DENVER AIRPORT

Mr. CARR. Does Southwest Airlines plan to use the new Denver Airport? If not, why not? Would you use Stapleton if it were kept open instead of Denver? Why?

[Southwest Airlines response follows:]

We do not have current plans to serve Denver because of the demands on our incoming aircraft capacity from California, Nevada, Arizona and Midway Airport in Chicago. The new Denver Airport is, however, because of cost and location, more attractive for longhaul, rather than shorthaul, air transportation.

TILTROTOR TECHNOLOGY

Mr. CARR. Mr. Kelleher, what are your views of tiltrotor technology and its application for commercial air service?

[Southwest Airlines response follows:]

The tiltrotor technology is very exciting. Before it is commercially feasible, of course, testing would have to demonstrate that the aircraft payload, operating and maintenance expenses, and speed would be competitive with jet aircraft. The Boeing 737, for example, is highly reliable and provides comparatively low seat mile costs. Unless the tiltrotor can compete on cost, premium fares would have to be charged, making it more difficult to attract Customers in shorthaul markets. It does not appear that tiltrotor is a viable alternative for longer haul markets.

QUESTIONS FOR MR. HARPER

AAR HIGH-SPEED RAIL POLICY

Mr. CARR. Mr. Harper, in what substantive ways does AAR's policy regarding high-speed passenger rail service differ from the policy announced by Conrail?

[AAR response follows:]

The industry policy statement appended to the AAR testimony was subscribed to by all AAR member roads, including Conrail. Thus Conrail's position is the industry position.

The purpose of the policy is to outline the terms necessary to plan and contract for new high speed rail passenger services. After shedding deficit passenger service which they had been forced to operate for decades, the Nation's freight railroads will not re-enter the field in any fashion unless they are compensated for all costs and given a reasonable profit margin and shielded from liability for passenger related accidents.

Mr. CARR. Your statement says the new industry policy offers "definitive guidelines," and "affords a new basis for dealing with the relationships that can be formed," according to your statement. But it never comes right out and says that the AAR and its member railroads support outright the development of high-speed rail in this country. Do you remember railroads support it enough to contribute financially?

[AAR response follows:]

Basically the answer is "no." The nation's freight railroads exited the passenger business in 1970 with the creation of Amtrak by Congress. Congress found that annual revenue losses from passenger service were costing the railroads in 1992 dollars approximately $900 million and were a major reason for the dire financial condition of the industry at that time. Passenger transportation (whether by rail or air) requires government subsidies all over the world. And certainly there are sound public policy reasons for doing so. However, the freight railroads should not be required to subsidize passenger service. Such a policy would endanger the ability of the freight railroads to efficiently serve the shipping community and the consumer; efficient service is vital to maintaining our competitiveness in the global market place.

Mr. Carr. The industry policy says that "railroads no longer bear entrepreneurial risk for passenger operations and will enter the arena only on a fully compensatory basis." What exactly does this mean?

[AAR response follows:]

America's freight railroads have obligations to their customers, employees, and shareholders to remain healthy providers of freight services. Subsidizing passenger operations is inconsistent with those responsibilities.

Mr. Carr. Your policy *conditions* industry support for high-speed rail on a *waiver of private sector liability* over passenger fatalities and injuries from accidents resulting from high-speed operations. As Mr. Claytor states in his testimony, if Amtrak is the operator, they would want to be released from liability also. If neither the freight railroads or the train operator were to be held liable, who do you think would have to bear the burden of liability?

[AAR response follows:]

The freight railroads believe that the authority sponsoring high-speed service should indemnify them, as underlyers, from any and all liability in the case of passenger operations.

Amtrak can of course speak for its own position.

Mr. Carr. This would seem to be a significant barrier to implementation of high-speed rail. Is that so?

[AAR response follows:]

Failure to deal with the liability issue would be a significant barrier to the implementation of high speed rail. It is the opinion of AAR that its member roads will not participate in high-speed projects unless they are totally indemnified.

Mr. Carr. Are signal, track and ATCS improvements along high-speed rights of way likely to be costly items? How would these improvements be capitalized?

[AAR response follows:]

The cost of improvements needed to adapt freight rail systems to occasional high-speed rail traffic varies by speed categories as well as by local topographical considerations.

Any speed above 79 mph will require cab signals or automatic train stops (ATS). Neither of these systems is installed on a substantial part of the U.S. trackage system. It will cost about $50,000–60,000 per locomotive. This would be as an overlay on centralized traffic controls (CTC), a signal system.

Above 90 mph or so, it is possible that improvements including curve realignment and new interlocking plant (switches) will be required. The cost will vary depending on the specific situation.

The cost factors for grade crossing elimination are described in the answer to Question 4.

Over 150 mph, the passenger trains must have separate tracks. AAR does not maintain cost estimate for these dedicated corridors since it is not contemplated that the freight roads will be involved in these projects. Costs will vary significantly in different corridors because of topography and environmental factors and on whether steel-wheel or magnetic levitation technology is chosen.

Advanced Train Control Systems (ATCS) have been studied and some development work has been done. While ATCS may add increments of safety to rail passenger operations, the systems have not yet been sufficiently developed and its non-safety benefits are so speculative that no freight railroad is yet willing to invest the substantial sums it would cost to install a nationwide system on the freight road's 116,000 route mile system.

Under normal practice, AAR is informed that the freight roads do not capitalize improvements which are paid for by others—in this case the high-speed passenger authority.

COST TO ELIMINATE GRADE CROSSINGS

Mr. CARR. Mr. Claytor's statement says that grade crossing elimination funds should come from the highway trust fund, since grade crossing accidents are really a highway problem, and not a railroad problem. What does it cost, on average, to eliminate a grade crossing, and how many might need to be eliminated along a typical intercity route?

[AAR response follows:]

The elimination of grade crossings on existing rail lines in order to accommodate high-speed passenger rail operations can be accomplished in several ways. The cost of grade crossing elimination would vary tremendously depending upon the solution employed. Grade crossing normally are eliminated by grade separation (either highway over rail, or rail over highway), rail line or highway relocation, or by simply closing the intersecting street or highway. The cost can vary from several million dollars for a grade separation structure (bridge) to a couple of thousand dollars for a simple street closure. Even with a closure, though, consideration must be given to adequate access to businesses and residences in the area, and a supplemental access road may be necessary.

It is very difficult to define a "typical" intercity rail segment which might be appropriate for high-speed rail passenger operations. The U.S. Department of Transportation in its *Rail-Highway Crossings Study* (April, 1989), said: "Along most existing line having potential for high-speed operation, crossings are estimated to occur at the rate of one crossing per mile of line." This estimate seems to be generally accurate in light of the approximate number of public grade crossings on the five rail corridors selected for high-speed rail demonstration purposed pursuant to Section 1010 of the Interstate Surface Transportation Efficiency Act of 1991 (ISTEA). Any solution of course, should include private crossings as well.

Corridor	Corridor miles	Public grade crossings
San Diego-Sacramento	655	600
Chicago-Detroit-Milwaukee-St. Louis	647	815
Washington, DC-Charlotte	478	585
Vancouver, BC, Canada-Eugene, OR	464	475

USE OF FREIGHT LINES FOR HIGH-SPEED RAIL

Mr. CARR. What percentage of the rail route-miles in this country are owned by the freight railroads, and to what extent does implementation of high-speed rail in this country outside the northeast corridor depend on agreement of the freight railroads to allow operations over their tracks?

[AAR response follows:]

Well over 90 percent of railroad route miles are owned by the freight railroads. Most high-speed rail operations under 150 mph would be over those tracks.

QUESTIONS FOR MR. MEAD

ADEQUATE DATABASES

Mr. CARR. Mr. Mead, your statement says that the federal commitment to high-speed ground transportation "must be proportional to the expected net social benefits, such as congestion relief and reduced pollution, that could result." Do we have databases today which are capable of providing that information and if not, what kind of data is lacking?

[GAO Response follows:]

Good predictions of net social benefits depend on good demand forecasts, which in turn depend on good on existing travel patterns. Some of these data do not exist. The biggest data gap is the general lack of "origin-destination" data for automobiles and intercity buses. We do not know where trips on these modes begin and end and therefore cannot determine the volume of automobile and intercity bus traffic between specific city pairs. Without this information, we have no sound basis upon which to forecast diversion from automobiles or intercity buses.

Most HSGT demand forecasts do not take into account the potential impacts of new or emerging technologies, such as tiltrotor aircraft, teleconferencing, and videoconferencing. Tiltrotor might provide high-speed access to city centers—one of the main selling points of HSGT. Some projections for videoconferencing indicate that this technology could reduce airline business travel by as much as 23 percent. This is the principal target market for high speed rail.

Even if the data were available to more accurately assess the traffic diversion potential of HSGT, it is no easy task to convert traffic shifts into net social savings. Yet, the social benefits from HSGT provide the bases for government support. For example, HSGT will reduce air emissions from passenger autos, but HSGT will primarily divert intercity travellers and most transportation induced emissions result from intraurban travel. Moreover, even if the amount and dispersion of the emissions reduction are calculable, translating the resulting health benefits into monetary terms will also be a difficult task. Yet, some sense of the value of the benefits is needed if we are to make the correct public investment decisions. We plan to study this area in more detail in response to a request from the Chairman, House Energy and Commerce Committee.

IMPACT ON AIRLINE COMPETITION

Mr. CARR. The GAO has taken the position that the federal government should not assist in a degree of airline consolidation which would undercut competition. When you speak of net social benefits from high-speed rail, would that mean that we should perhaps discount high-speed rail investment for any adverse impacts on the airlines if those impacts resulted in less airline competition?

[GAO response follows:]

When we refer to net social benefits from HSGT we mean to include impacts on other modes of transportation and on the users of those modes. In the case of air travel, a principal benefit claimed by supporters of HSGT is that it will reduce air traffic congestion at major airports. The benefits to the airlines include savings in fuel and crew costs and the benefits to airline passengers include the saved travel time. Because it is generally assumed the HSGT would be developed in those markets where air and highway networks are already near capacity, negative impacts are ignored. However, any negative impacts on existing air travel would need to be considered in developing an estimate of the *net impacts* from HSGT investment. This could include the impact on airline competition that caused on airline to be driven from the market. In fact, our work on airline fares shows that in markets served by low fare airlines like Southwest Airlines, air fares tend to be lower. Investments in HSGT that might compete with low fare carriers like Southwest should consider the impacts on the airline and any implications on airline competition nationally.

Mr. CARR. You say that "because there is little assurance that these systems can earn a positive return on invested capital, they are considered to be very risky investments by private investors." I might argue that the federal government should not be making risky investments that private investors are not willing to make. We might make such investment based on a policy decision that the *social benefits* are worth it. But you have already testified that there are great gaps in our quantifiable understanding of the benefits. On what, then, should we base our investment decision?

[GAO Response follows:]

We suggest that, before making a major commitment to HSGT projects, the federal government should support efforts to close the gaps in the data, to the extent possible. Even with better data, it will be difficult to precisely quantify and value social benefits that might result from these systems. The best that can be hoped for is that better information will at least provide some "order of magnitude" estimates of the benefits to contrast to the expected costs of these systems.

RIDERSHIP AND REVENUE FORECASTS

Mr. CARR. Your statement says the private sector believes that ridership and revenue forecasts for high-speed rail systems may be exaggerated. Why do they think this?

[GAO response follows:]

The lack of operating experience with HSGT systems in the United States leads to skepticism of ridership forecasts. In the field of demand forecasting, results are measured against previous forecasts and actual travel behavior as tests of reasonableness. Since no HSGT systems operate above 125 mph in the United States, no basis of reasonableness exists.

The degree of rigor and sophistication used in developing HSGT demand forecasts varies. Often, as the project progresses from initial concepts to the point of obtaining financing, demand forecasts tend to become more conservative.

Further, demand forecasting is believed to yield more reliable results if it can be modeled on actual travel behavior in similar circumstances—called "revealed preference." Since there are no HSGT systems with speeds over 125 mph in the United States, there is no way to obtain revealed preference. Some projections extrapolate from experience overseas, but circumstances are usually sufficiently different from those in the U.S. as to limit the usefulness of the data. To compensate for the lack of ridership data, travel demand forecasters are attempting to use stated preference models to help estimate how Americans might respond to HSGT. Stated preference is based on responses to surveys that ask people if they would ride a system if it were available. Because actual behavior is generally a better predictor than what people say they would do in hypothetical situations, research is currently underway to improve the reliability of stated preference models.

ADMINISTRATION'S FUNDING REQUEST

Mr. CARR. The current administration is expected to propose large increases in funding for high-speed rail, beginning in fiscal year 1994. What criteria should we subject these systems to, in order to evaluate the merit of their proposals?

[GAO response follows:]

Before determining which HSGT systems should receive federal funding, the federal government needs to examine transportation corridors to determine the nature of existing transportation problems. Then, potential solutions must be analyzed to determine which types—air—highway—HSGT—or combination thereof, would provide the most cost-effective solution in each corridor.

If an analysis should indicate that HSGT systems are the best alternative in more than one corridor, each proposed system should be analyzed in terms of potential ridership, revenues, subsidies, and social benefits. As stated above, difficulties currently exist in developing accurate information in each of these areas. We expect to examine these difficulties in greater detail in the coming months to determine how to best solve these difficulties. We anticipate our work will point out a need for a greater federal role in data collection and analysis before the federal government invests substantial funds in a HSGT system.

NORTHEAST CORRIDOR AND OTHER HIGH-SPEED CORRIDORS

Mr. FOGLIETTA. Mr. Claytor, I am a frequent traveler on the Metroliner between Washington and Philadelphia. I am looking forward to riding on the new X–2000 train. I am a strong supporter of rail transit—both urban mass transit systems as well as rail transportation between cities. The service AMTRAK provides represents a vital link between cities on the East Coast. In addition to convenient and frequent service, the rail system offers a legitimate alternative for commuters between cities to avoid ever-mounting congestion on highways and in airports. It is also a major commercial and economic generator for my city and other major cities on the corridor.

It is my understanding that the Northeast Corridor system is extremely successful. In fact, it operates at a 200 percent profit. And AMTRAK carries twice as many passengers everyday between New York and Washington as any single airline.

Given these facts, and AMTRAK's dominant market share in the Northeast Corridor, do you agree that any additional funds to maintain the corridor and expand high-speed rail technology should be focused on the Northeast Corridor—where a large amount of infrastructure is already in place and a high speed rail technology is most likely to succeed?

[Amtrak response follows:]

Amtrak agrees that its existing market share in and the unparalleled track quality of its Northeast Corridor make that service the best choice for demonstrating high speed rail technology.

However, once this technology is proven to be the success we are confident it will be in the Northeast Corridor, there are several other excellent candidate corridors for high speed rail in the United States. One is the Empire Corridor, between New York and Albany. This multi-frequency service with high population densities and near-high speed track quality, thanks to the State of New York's ambitious track upgrade program, would be another area in which we believe high speed rail will prove to be a viable transportation form.

Other corridors also hold promise, although track standards on those corridors may not be as advanced as those achieved in the Northeast or Empire Corridors. The five corridors designated by the Federal Railroad Administration to receive funding for track improvements under the Intermodal Surface Transportation Act of 1991 are good examples of other potential services that could benefit from such high speed technology demonstrations. These corridors are:

San Diego-Los Angeles-Bakersfield-Stockton-Oakland/Sacramento.
Detroit-Chicago-St. Louis/Milwaukee.
Miami-West Palm Beach-Orlando-Tampa.
Washington, DC-Richmond-Raleigh-Greensboro-Charlotte.
Vancouver, BC-Seattle-Portland-Eugene.

Additionally, Section 812 of Public law 102-533, the Amtrak Authorization and Development Act, which was signed into legislation on October 27, 1992, outlines certain directives relating to experimentation with new high speed technologies. Section 812(c) mandates that Amtrak "in order to facilitate efforts to increase train speeds throughout the national intercity rail passenger system, shall upon request by eligible applicants, consult and cooperate, to the extent feasible, with such applicants proposing technology demonstrations authorized and funded pursuant to Federal law." Thus, the Corporation has a legislative mandate to demonstrate new technology throughout the national system.

PHILADELPHIA'S 30TH STREET STATION

Mr. Foglietta. Philadelphia's economy has been decimated over the past decades. Last week, the Pentagon dealt Philadelphia the third blow with three base closures over the past six years. I understand that AMTRAK's procurement office is based in Philadelphia. Can you give your assurance that the procurement operation will stay in Philadelphia. Further, would an added investment in high speed rail in the Northeast corridor translate into additional jobs at the Philadelphia procurement operations?

[Amtrak response follows:]

The procurement function at Amtrak has been centered in Philadelphia since 1981 and it is Amtrak's intent that this function remain headquartered at our 30th Street Station offices indefinitely. As investment in high-speed rail increases, a requirement for additional contract administration personnel could be generated. However, the exact impact is difficult to determine until the level of additional investment and its make-up are defined.

[Prepared statements from Larry Salci (Texas TGV Corporation); Dennis Nichols (Turbomeca Engine Corporation); Charles Smith (Florida Department of Transportation) follows:]

[Clerk's note.—Larry Salci of the Texas TGV Corporation testified before the Subcommittee on March 23, 1993. (See Part 7A: Testimony of Members and Public Witnesses).]

STATEMENT OF
LARRY E. SALCI
TEXAS TGV CORPORATION

BEFORE
THE HOUSE TRANSPORTATION
APPROPRIATIONS SUBCOMMITTEE
MARCH 15, 1993

Mr. Chairman, and members of the Subcommittee, thank you for inviting me to testify before you on behalf of the Texas TGV Corporation. The scheduling of this hearing is indeed timely, coming just two weeks after President Clinton's announcement of important policy initiatives to assist the start-up phase and construction of high speed rail projects, this hearing presents the unique opportunity to suggest a structure for the President's initiatives. I applaud your quick action in holding this hearing and appreciate your hearing our views on high speed rail.

I would like to take just a moment to briefly describe the Texas TGV Corporation and the project we are pursuing. The three major industrial shareholders are Morrison-Knudsen, Bombardier Corporation and GEC-Alsthom.

ROUTE ALIGNMENT

The Texas TGV will provide nonstop 200 MPH service between Houston and Dallas, between San Antonio, Austin and Dallas, and between Dallas DFW Airport and Fort Worth. This is a service area, commonly referred to as the "Texas Triangle," which contains 60% of the state's population and which generates over 75% of the state's gross domestic product.

Travel between these cities will be on a non-stop schedule with half hour departures through most of the day and with fifteen minute departures during peak periods. The TGV will provide service at a very high level of reliability, comfort, and ease of use. Stations or terminals are planned for:

- Houston, Central Business District
- Houston, Northwest Suburban
- Dallas/Fort Worth International Airport
- Fort Worth
- Austin
- San Antonio

In addition to these principal stations, service is being planned for the cities of Bryan--College Station and Waco, and possibly Houston Intercontinental Airport, through frequency and method of service to these communities has yet to be determined.

The route for the Texas TGV is appended to this statement.

PASSENGER ROLLING STOCK AND ON BOARD SERVICE

The rolling stock will be specially adapted for the Texas TGV and will be based on the design of the next generation of the operationally proven TGV Atlantique which currently operates at 186 M.P.H. This was the same design which established the world ground speed record for fixed guideway vehicles of 320 miles per hour in May of 1990. The system planned for Texas will go beyond the Atlantique; it will initially operate at 200 M.P.H. and the system infrastructure is designed to accommodate speeds up to 250 M.P.H. Also, in terms of on-board services and amenities, features have been specifically developed to enhance the productivity of the Texas TGV passenger, and include:

- Three classes of passenger accommodations: First Class, Business Class and Coach.
- Expanded seat spacing and legroom in all accommodations which approaches First Class seat spacing in airlines.
- Reserved seating for all passengers.
- Several small group seating arrangements with conference/work tables.
- High quality commercial phone service available throughout the train. Free phone calls may be made to either destination or departure terminal cities. All long distance carriers will be accessible for calls outside of the Triangle simply by using the "Dial O" service which is available on most public phones today.
- Business productivity features including on board rental car services as well as facsimile transmission and receive capabilities.
- A food and beverage car at the center of train, with in-seat service to First and Business Class passengers.
- Integrated tickets with selected airlines will allow for smooth feeder operations to major hub airports, such as DFW. Check in service provided at TGV terminals by host carrier personnel will include baggage check through and seat assignments for all trip segments.

- A total "Customer Service" approach has been contemplated to provide seamless service for all passengers including those with an airport connection.
- Arrival and departure schedules at half hour intervals throughout the day with increased frequency during heavy demand periods.
- Specially designed seating and other accommodations -- including level platform access -- will enable persons with disabilities to easily board and use the high speed train services.
- Texas TGV expects a fare structure that will be competitive with or less than the airline fare structure.

A detailed analysis of the revenue impacts of these features is currently under way.

TEXAS TGV CAN EFFECTIVELY LINK WITH LONG HAUL AIR OPERATIONS

With these kinds of amenities and reliable performance, the Texas TGV should be highly competitive with all modes of travel between Texas Triangle cities. The Texas TGV should also be ideally suited in a feeder role for major hub airports such as Dallas/Fort Worth (DFW) and Houston Intercontinental (IAH). Over the next twenty years, carriers serving these airports will be looking to ever distant markets to serve out of these hubs. New, more efficient long haul aircraft will accentuate this effort.

On the operational side, airlines will continue to look for better operating efficiencies. They are finding these efficiencies in their hub operations by considering the shift to "continuous" hubbing. This will require high-frequency and high volume feeds, particularly on the short haul routes, to make them especially effective. At the same time, it is very costly to offer more than twelve to thirteen such short haul connections by air. An integrated service using the Texas TGV, on the other hand, should be able to dramatically increase service frequencies to all Texas cities by perhaps a factor of three. This service should also be able to offer this for lower total costs than these carriers now incur, and should be able to do so with much greater on-time reliability. With highly integrated facilities at the hub airport and a continued role for the long haul carriers in selling the tickets and handling passenger check in, the Texas TGV should be a highly complimentary -- and highly efficient -- alternative to continued use of aircraft to feed passengers from the Texas Triangle cities to Texas' major air hubs.

This alliance can be crucial in improving the ability of long haul carriers to efficiently serve more distant markets sooner and existing markets better.

EMPLOYMENT IMPACTS

The Texas TGV Project is expected to provide 30,000 - 35,000 construction phase jobs and nearly 10,000 direct and indirect jobs during its operations phase. High speed train technology will utilize many of the telecommunications and aerospace skills which have already come to Texas. Further, with an assembly plant in the state, Texas TGV will position Texas as a base from which high speed rail skills, services, and products can be provided to other parts of the country as they follow in their development of intercity high speed rail.

I want to emphasize, however, Mr. Chairman that while the Texas TGV Project will incorporate French technology, through technology transfer from GEC-Alsthom and the significant United States presence of Bombardier Corporation, manufacture of the rolling stock will fully comply with Buy America requirements. Moreover, the engineering and civil work construction which is by far the largest component of the project's cost will be performed by U.S. corporations and managed by our corporate shareholder, Morrison-Knudsen.

Having provided you with the scope of the Texas TGV Project as a backdrop; I would like to turn to the focus of your hearing today: Developing high speed rail in the United States. We would offer the following suggestions.

I. FEDERAL ASSISTANCE FOR PLANNING, FEASIBILITY, RIDERSHIP AND ENVIRONMENTAL STUDIES AS WELL AS OTHER FEDERAL MANDATES

Today, virtually every other mode of passenger transportation is eligible for federal assistance in the planning, engineering and environmental impact analysis phase of a given project. In the case of highways and rapid transit new starts, 80% of the planning, engineering and environmental impact statement costs are assisted by federal grant funds. In an effort to reduce modal bias, we would suggest a similar structure of assistance for high speed rail projects. Following the efforts of ISTEA to minimize the bias among surface transportation modes, we believe that federal funding for these essential steps, which minimize engineering and financial mistakes later, is a reasonable federal investment and an appropriate federal promotion role. The source of these funds could perhaps come through adding some flexibility provisions to Section 1036 of the High Speed Rail Ground Transportation Program which has already been authorized in ISTEA through 1997.

II. HIGH SPEED RAIL TRANSPORTATION TRUST FUND ACCOUNT

Given the President's and the Congress' dual focus on infrastructure investment and reducing the deficit, we would suggest a user fee concept. Specifically, in exchange for extending eligibility to high speed rail programs for Highway Trust Funds today, we would propose a plan to repay today's investment with a 10% ticket tax to be imposed on high speed rail passengers, the proceeds of which would be returned to the Highway Trust Fund. The amount to be made eligible for high speed rail funding could be based upon such factors as conservative ridership projections, a repayment schedule which reflects the useful life of the system, and the near-term financial needs of developing other high speed rail projects. This concept is similar to the user fees employed by both surface transportation and aviation modes. Admittedly, there is a draw on the trust fund in advance of repayment, but this investment would be analogous to the federal support provided to highways and the aviation industry prior to the establishment of their respective trust funds.

III. PERMIT STATES TO USE RIGHT OF WAY REVOLVING FUNDS FOR HIGH SPEED RAIL PROJECTS

Mr. Chairman, Section 128 of S. 1204, the Senate version of what became ISTEA, proposed "passenger rail facilities" as eligible projects for the use of right-of-way revolving account funds. Although this provision was dropped in conference, we would suggest its reconsideration. The revolving fund concept has saved many millions of dollars in highway construction costs, it could provide similar savings to high speed rail projects.

IV. SENIOR GRADE BOND INSURANCE PROGRAM

Mr. Chairman, the initiation of an investment grade bond insurance program for infrastructure is really the adaptation of a concept that has worked in attracting private sector investments to health care and educational facilities. Last month the Commission to Promote Investment in America's Infrastructure, which was established under ISTEA, issued its final report. Among it's recommendations is a proposal to establish an insurance mechanism to enhance the rating of infrastructure projects (which might include high speed rail) to attract private capital to a project. Using the model of the

College Construction Loan Insurance Association (ConnieLee), the Commission focused on the success that ConnieLee has achieved in guaranteeing bonds issued by colleges, universities and teaching hospitals. By providing this bond guarantee, project ratings are raised to investment grade, attracting investors which otherwise might ignore such investment opportunities. A bond insurance program, established with a minimum federal investment, could foster literally millions of dollars in private investment into high speed rail and other infrastructure projects.

V. TAX-EXEMPT BOND TREATMENT FOR HIGH SPEED RAIL PROJECTS

Under current law, bonds issued for high speed rail projects are tax-exempt. They are, however, subject to the state private activity volume cap which renders them almost useless because these caps are so low. By allowing bonds issued for high speed rail projects to be treated in an identical fashion to bonds issued for airports or other surface transportation projects, i.e., outside these volume caps, significant private investment can be attracted to high speed rail projects.

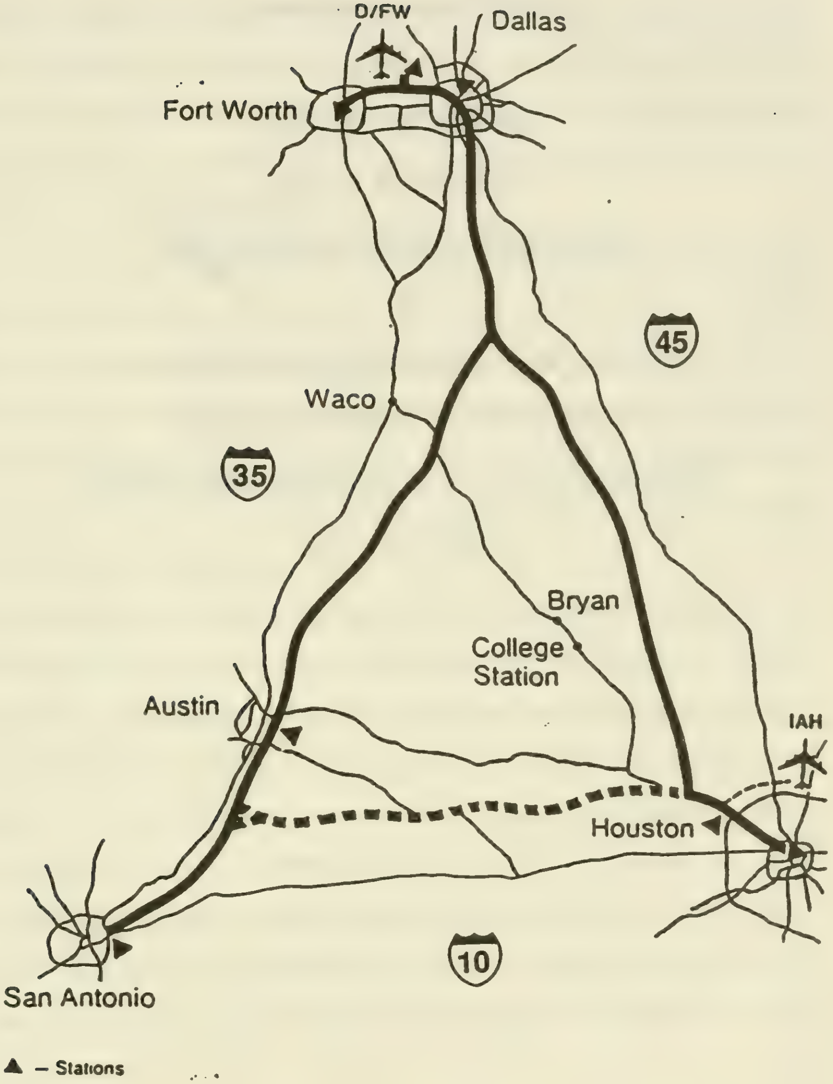
CONCLUSION

Mr. Chairman, these five suggestions are offered as a array of ideas which will greatly assist in the attraction of private capital to high speed rail. Clearly, what we are proposing also involves direct federal expenditures for high speed rail, a clear change in the federal policy which has prevailed over the past decade. High speed rail is not a technology still under test and development. It's benefits have been demonstrated widely in Europe and Japan. Promoting the development of high speed rail in the U.S. will have real and substantive benefits beyond just mobility enhancement. Environmental and social improvements, and long-term job creation are benefits which will have real impact on our nation.

We are suggesting a federal role which will serve to attract private capital. We will acknowledge that levels of private investment are determined by levels of risk. Some of the concepts we have outlined are clearly designed to reduce levels of risk which in turn have the inverse effect of attracting private capital.

Perhaps the most difficult capital to find is the venture capital needed to begin these projects. For this reason we have suggested direct federal assistance on par with that historically accorded to other modes of transportation. We have also suggested direct funding for construction. While we have not settled on any match levels, it is our assessment that "overmatches" of private funds similar to the "overmatch" of state or local funds for the FTA Section 3 New Start program should be considered. While the Federal government would clearly take on the initial burden of establishing project feasibility, as it does in other modes of transportation, we would propose that the private sector fund a large share of construction costs in terms of absolute dollars.

In closing, Mr. Chairman, let me say that while the President's leadership on high speed rail has attracted national interest in this technology, we recognize that you are now confronted with whether or not there should be a federal role in developing high speed rail and how that role is to be paid for. This is not an enviable task, but we pledge to work with you in anyway possible to help in this effort. Thank you for inviting me to testify. I will be pleased to answer any questions.


D/FW
Dallas
Fort Worth
45
Waco
35
Bryan
College Station
Austin
IAH
Houston
San Antonio
10
▲ – Stations

SUBMITTED TESTIMONY

OF

DENNIS B. NICHOLS

PRESIDENT & CEO

TURBOMECA ENGINE CORPORATION

TO

THE SUBCOMMITTEE ON TRANSPORTATION

COMMITTEE ON APPROPRIATIONS

UNITED STATES HOUSE OF REPRESENTATIVES

MARCH 15, 1993

My name is Dennis B. Nichols. I am President and CEO of Turbomeca Engine Corporation in Grand Prairie, Texas. Turbomeca manufactures turbine engines for aircraft, ship, rail and industrial applications including power co-generation and tri-generation. Besides a variety of commercial customers, our family of turbine engines are in service with the U.S. Air Force, U.S. Navy, U.S. Customs Service and Amtrak.

Turbomeca is fully committed to the development of high speed rail in the United States. We were the earliest entrant into the field of turbine powered rail propulsion. Our original Turbotrains were introduced in the United States, France, Egypt and Iran in the 1970's. A commitment to nuclear power electrified the French rail system and ended the market for non-electric high speed propulsion. All of Europe and Japan went electric. The American financial commitment to the rail mode was extremely limited. No high speed corridors were developed beyond the Northeast Corridor.

Despite this lack of a market, the original Turbotrains have played an important role in rail passenger service, and now have over 300 million miles in world-wide service. The Turbo trains have been well received. The Near East old generation train sets are being upgraded. In America's Empire Corridor, Turbotrain ridership grew five times faster than Amtrak's national average. Nonetheless, there were no new commitments to high speed corridors and no new sales of Turbotrains for two decades. Further, the Turbotrain fleet was small and didn't fit well with the diesel culture at Amtrak. Despite excellent on time performance and public reception, Amtrak found operating and maintenance costs higher than diesel locomotives on the old generation turbotrains. Recently, Turbomeca has taken over direct responsibility for the heavy maintenance and overhaul of these older engines. We are working cooperatively with Amtrak and are already showing great improvement in turnaround times on engines and parts, and are resolving past maintenance problems.

Why has Turbomeca decided to get back into the railroad business after two decades of a dead market? First, Amtrak has approximately 20 Turbotrains in its existing fleet and has become a valued customer. Second, there has been a dramatic advance in turbine technology which opens an exciting potential for affordable high speed rail in non-electrified territory. Third, we believe America is on the brink of a major commitment to high speed rail through the incremental approach. We intend to be a part of it.

THE TURBINE TECHNOLOGY ADVANCE

There has been rapid advancement in turbine technology over the past two decades. With off-the-shelf turbine propulsion we can today reach speeds of up to 125 mph and beyond on standard FRA Class 6 freight track. We have engines on the test stand that will allow train speeds of 150 mph - 185 mph and higher with new design locomotives. We believe these very high speeds can be reached on existing rights-of-way in an incremental fashion following the guidelines of the recent Association of American Railroad/Amtrak Agreement on High Speed Rail.

There are several factors which make turbine powered locomotives superior to other technologies available today, and makes it particularly suited for the American market. The new generation engines have advantages of low pollution and fuel efficiency. The modular design will provide ease of maintenance. The lower locomotive weight will result in significantly reduced wear on the rights of way over that which would be caused by high speed diesel train operations.

The high speed rail start up cost will primarily consist of modest track structure upgrades in areas where Class 6 track is not in place. State of the art "cab signalling", will be necessary. The major cost will be for high speed grade crossing protection or elimination. These are one time costs. While not insignificant, they are penny ante when compared to the cost of a new airport or a new lane of interstate. Maintenance will be only to the FRA Class 6 standard for 125 mph service.

The key element of the turbine powered locomotive is the simple design of the power train (engine, transmission, drive shaft, power truck). This design results in substantial weight reduction compared with other fossil-fueled locomotives. By design, the gas turbine has a very attractive horse power to weight ratio. By directly coupling mechanical energy to the axles, the additional weight of the major electrical components is eliminated.

The transmission mechanically delivers the turbine engine power directly to the power truck gearboxes through driveshafts. This power train results in a light weight locomotive that is capable of traveling at speeds of 125 mph and above on standard Class 6 track. The resulting track forces at 125 mph are approximately 25% less that diesel locomotives traveling at a similar speed.

Light weight is perhaps the most critical issue in high speed rail. The major benefit is lower maintenance costs associated with track wear. By way of comparison, recently designed turbine locomotives weigh about 81.5 tons for 3083 horsepower compared to 131 tons for a comparable diesel. This difference in weight is the equivalent of hauling an extra non-revenue producing passenger car for the life of the diesel locomotive with all the fuel consumption and wear that would be associated with this dead weight.

Turbomeca will be offering the Makila engine which is an improved new generation derivative of the existing engine in rail service. It is of a simple modular design and has proven its reliability in demanding aircraft service. This unit runs on standard diesel #2 fuel or can be easily converted to clean burning alternative fuels such as natural gas, ethanol or methanol. We will guarantee its performance through power-by-the-hour contracts and believe the Makila will operate in corridor train service for at least 6,000 hours, which will undoubtedly be in excess of 2 1/2 years, before overhaul is required.

Our turbine powered locomotives will also offer the option of "dual power" which will allow them to operate, at more limited speeds, over electrified trackage. Right now, "dual mode" is only required for third rail operations into New York City tunnels. It is quite possible that dual-mode third rail may become an attractive option in a number of urban Clean Air Act non-attainment centers. We will be working with Amtrak and the State of New York to push the "technology envelope" to achieve higher speed on dual mode in the short term.

THE INCREMENTAL APPROACH TO HIGH SPEED RAIL

Turbomeca's re-entry into the field of high speed rail in America is the direct result of the work by the Coalition of Northeast Governors (CONEG). In the late 1970's and early 1980's CONEG began to address the problems of highway and air congestion in the Northeast. CONEG formed the High Speed Rail Task Force to improve intercity rail passenger service throughout the Northeast. In March of 1986, the task force launched an intensive investigation into technologies and options available for future high speed rail service. This included a program of CONEG/FRA/Amtrak equipment testing and evaluation.

In March of 1990, CONEG announced a new high speed rail policy that called for "...prompt action on a program of proven technologies" and made recommendations. CONEG specifically called for equipment with "...the capability to operate in both electrified and non-electrified rights of way [with] the ability to operate at high speeds around curves. The Amtrak/CONEG/FRA equipment tests have demonstrated the ability of existing turbo-propulsion locomotives, and tilt-technology passenger coaches to significantly improve service..."

In response to CONEG, Congress appropriated $14 million for the development of a high-speed dual-mode locomotive capable of operating through non-electrified territory. This was originally intended for initial service on the New York-Boston segment of the Northeast Corridor. Although the NEC is in the process of being fully electrified, Amtrak has identified 5 corridors where the dual mode locomotive will be applicable.

Following the Congressional appropriation, Amtrak developed specifications for the new generation locomotive. No proposal met the specifications and Amtrak did not award a contract. However, several events came together which allowed Amtrak to announce a new policy for an incremental approach to bringing high speed rail to the United States. Turbomeca is in complete support of that policy. The events were:

--**The Five High Speed Rail Corridors.** In the Fall of 1992, following a provision of the Intermodal Surface Transportation Efficiency Act, the Bush Administration designated 5 high speed rail corridors (and two existing corridors) in the United States.

--**The Clinton Commitment.** During the Fall campaign Bill Clinton committed to high speed rail funding which raised new hope across the country.

--**The Freight Railroad/Amtrak High Speed Rail Agreement.** Graham Claytor, President of Amtrak, and Edwin Harper, President of the Association of American Railroads, signed an accord which, if the conditions can be met, will make it possible for high speed rail service of up 150 mph along existing freight rights of way.

--The ABB/Tilt Train. Introduction of the 125 mph ABB/tilt train into demonstration NEC service created a great deal of excitement around the United States. The German ICE train will come to the U.S. for testing later this year.

--The New York Demonstration Project. New York State, Amtrak and Turbomeca have entered into a cooperative proposal to demonstrate new generation Makila engines in 125 mph train service on the Empire Corridor between Albany and New York City. The Empire Corridor Demonstration will provide a comprehensive test bed for non electric high speed technology. The Makila test will be at the heart of the project. In addition to the propulsion demonstration, Amtrak will overhaul the shells of existing turboliner coaches and retrofit a state of the art interior as the design model for the high speed train set of the future. Following the demonstration in the Empire Corridor, this train set will be available for Corridor Demonstration Service throughout the United States.

As a result of these fast moving events, Amtrak recently announced a new program for a "systems approach" to high speed rail. The cornerstone of developing a "high speed system" will be the procurement of 26 electric train sets for the electrified territory on the Northeast Corridor. Amtrak is expected to release a "Request for Quotation" later this year. The high speed passenger cars must be designed to operated with or without tilt. As part of the procurement, Amtrak will release specifications for a locomotive to operate at speeds of at least 125 mph in non-electrified territory. The locomotive must have the ability to operate with and without dual-mode. The electric and non-electric locomotives and passenger cars will be compatible and interchangeable. The only restriction will be whether the corridor is electrified or not electrified. This will result in an American family of high speed rail equipment ready for introduction into Corridors across the country. Amtrak is outlining this program in greater detail at today's hearing. This approach builds on Amtrak's previous experience and on European practice. It is cost effective, practical, and can be undertaken with relative speed.

TURBINE --THE LOW COST AND LOW POLLUTING HIGH SPEED ALTERNATIVE

With the passing of the Clean Air Act in 1990, tougher emissions standards for all modes of transportation will be required by 1995. In Southern California for example, the 9th Circuit Court of Appeals recently ordered the federal EPA to draw up a clean air plan for the greater Los Angeles area. That may mean emissions caps for all modes of transportation including rail and aviation. A direct result could be a limit on airline take-off and landings at Los Angeles International Airport. Passenger rail, which has been determined to be 50% more fuel efficient than air travel, could compete for air passenger traffic between close in cities if a clean burning locomotive is available. Turbine engines by nature are much more clean burning than diesels. Studies have shown that in a typical 250 mile corridor, turbine powered locomotives emit only 17% of the exhaust emissions of a standard diesel locomotive, and 25% of the exhaust emissions of a fossil fuel power plant which could provide the power for an electric train. Turbines have the capability to run on alternative fuels such as natural gas, methanol, and ethanol. This can reduce emissions even further. I was pleased to note that the California Department of Transportation, Division of Rail, has asked the Federal Railroad Administration to fund a high speed ground demonstration using gas turbine engines. Turbine technology allows an incremental approach to high speed rail, without the prohibitive costs involved in electrification. The Transportation Research Board released a report in January, 1992, that quantifies the costs in more detail. The results indicate that turbine technology is at least five times more cost-effective in terms of capital expenditures per minute saved in travel time.

HIGH SPEED RAIL, SUBSIDIES AND THE CONGRESS

If high speed rail is to be ultimately successful in this country, Congress and the Administration must play a major role. There will have to be government support for the infrastructure. Hopefully, operations will be self-sustaining.

There is nothing immoral about a subsidy, if there is sufficient public interest. All modes of transportation receive public subsidies for infrastructure or operations. All freight and passenger modes competing with rail receive an enormous subsidy. The freight rail carriers receive almost nothing by way of subsidy. The freight truck mode receives a subsidy of about $4 billion a year by virtue of the underpayment for damage to the highway system. Freight barges get something under $1 billion a year as the Corps of Engineers builds and operates their rights of way. Passenger subsidies are as skewed. In 1990, Amtrak received a $340 million subsidy in a $2 billion operating budget. However, during that same year the government collected about $3.9 billion in aviation user taxes, but spent about $7.1 billion on aviation programs. The difference is a $3 billion annual subsidy for private sector airline operations. Again, nothing is wrong with these subsidies so long as there is sufficient public interest.

However, the subsidy issue is a thorny one as it relates to the introduction of high speed rail into corridors across the United States. Except in the Northeast corridor, passenger trains operate over 100% privately financed roadbed. Hard pressed freight carriers maintain these tracks to meet freight time tables, which are generally lower than passenger requirements. If freight standards control track speed, high speed rail is totally out of the question. So to put it simply, if high speed rail is to come to the U.S, some form of government financial assistance will be necessary. The question is how much, and in what form?

All of this leads me to the conclusion that passenger rail must be the beneficiary of a

dedicated trust fund. The Clinton Administration has proposed the 2.5 cents in fuel taxes going to deficit reduction be extended and redirected to the surface transportation trust fund. Turbomeca strongly supports the Amtrak proposal to direct that 2.5 cents to passenger, high speed and commuter rail projects. All gas tax should to into surface transportation including high speed rail. If there is a need for deficit reduction from this source, then the entire trust fund should be ratcheted down across the board as a part of the annual appropriations process. Turbomeca Engine Corporation of Grand Prairie Texas looks forward to a bright future as high speed rail comes to America.

1720315.31r

Subcommittee on Transportation and Related Agencies
The Honorable Bob Carr, Chairman

House Appropriations Committee
United States House of Representatives

Statement Submitted by Charles H. Smith
Florida Department of Transportation

March 15, 1993

HIGH SPEED RAIL AND MAGLEV PROJECTS IN FLORIDA

For the past ten years, the State of Florida has been aggressively working to establish high speed rail and maglev transportation systems as a component of our state's transportation network. Not only do we have to accommodate our normal population and business activities, but we also have to supply transportation facilities for the 40 million tourists who visit our state each year. As you can imagine, this places an extraordinary strain on our existing highways and airports. High speed surface systems must be developed to complement these other modes and allow us to minimize the difficult prospect of trying to accommodate all of our travel with new or expanded highways and airports. High speed ground transportation, whether wheel on rail or maglev technologies, is an energy efficient and environmentally sensitive form of passenger transportation that can reduce our dependence on foreign oil and create a new industry with all of the attendant jobs and economic stimulus activity.

Feasibility Studies

Commencing with statewide feasibility and technology studies in 1982, our state has moved forward deliberately and systematically with environmental, financial and technology evaluations for several high speed rail and maglev proposals. In 1984, a high speed rail feasibility study concluded that implementation of a high speed rail system in the state was feasible and that these systems could be built and operated profitably by private sector enterprise using innovative financing techniques. This conclusion was based on the assumptions that right of way would be provided by the state and that tax exempt bonding, real estate development and benefit assessment methods would be used to finance the project's infrastructure costs.

Public-Private Partnership

In 1984, the Florida legislature enacted the Florida High Speed Rail Transportation Commission Act which established the authority to solicit private sector proposals to finance, build and operate high speed rail systems in the State. The Act established a centralized, competitive procurement and licensing procedure for the award of a franchise. Once issued, the franchise was to become the sole authority for the rail line, stations, and any real estate developments used for financing the system. The Act created a "one-stop permitting process" for all environmental and land use requirements.

In 1987, the State issued a request for proposals which was responded to in March, 1988 by two private sector entities, the Florida High Speed Rail Corporation and the Florida TGV Company. Both companies proposed to build a high speed rail system from Miami to Orlando and Tampa. The Florida High Speed Rail Corporation proposed to use the ABB X-2000 technology and the Florida TGV Company proposed to use the French TGV Atlantique train. Initially, both proposals assumed revenues generated from real estate developments would be used to offset capital and infrastructure costs. The local governments' opposition to the expanded use of real estate development as the major means of financing this project along with the realization by the two proposers that high speed rail systems could not be built without public funding, led to the withdrawal of the applications from further consideration.

1992 High Speed Rail Act

A serious shortcoming in the 1984 statutory process was its failure to structure decision-making in a progressive, logical sequence that corresponded to business decisions of any private entity undertaking a major capital investment. The Florida legislature, amended the High Speed Rail Act in 1992 to deal with these problems and to streamline the application and franchise process. The new law emphasizes the need for a stronger public/private partnership.

Instead of the all encompassing process established by the original act, the amended law created a phased approach to the application and franchise process. The first phase would be the approval and award of a franchise to a private entity to build a high speed rail system based on that entity's business and financial plans. Once that is done, the Department, along with other local, regional and state agencies, would work together with the franchisee to develop the more detailed plans such as design, construction and all environmental documentation for the project. Formal local and statewide hearings would then be conducted and finally the Florida Governor an Cabinet would award certification for the project to move forward to implementation.

Current High Speed Rail Studies

Before proceeding with a new request for proposals in accordance with the 1992 high speed rail act and with the new application and franchise process, the Florida Department of Transportation opted to conduct more detailed analysis of both intercity high speed rail ridership potential and of alignments and corridors throughout the state that are suitable for high speed rail operation.

Starting in December, 1991, the Department undertook three study efforts as follows:

1. Statewide corridor assessment study: This study investigated various corridors throughout the state and their potential for high speed rail implementation. The study evaluated many existing rail, highway, and utility corridors and identified the most promising candidates based on environmental consideration, physical features, geometry, operational considerations and potential for capacity enhancement and for high speed rail implementations.

2. Orlando-Tampa Corridor Assessment Study: This study investigated in more detail the Orlando-Tampa Corridor and its suitability for high speed rail implementation. Because of intensive development and the existence of major wetlands within the Corridor, the Orlando-Tampa Study was forced to focus on existing corridors connecting Tampa to Orlando - mainly the I-4/I-275 and the CSX rail corridors. Because of the geometric limitations associated with the CSX Corridor and the numerous at-grade crossings that would have to be separated, the I-4/I-275 corridor is proving to be the best alternative for high speed rail implementation between Orlando and Tampa. For this reason, the Department has undertaken a bold effort to preserve an envelope within the median of the I-4/I-275 corridor between Orlando and Tampa for future high speed rail implementation. Several alternative route alignments and station sites have been investigated as shown in Figure 1.

3. Statewide Market and Ridership Study. The purpose of this study is to document existing intercity travel between Florida's major cities, to assess intercity travel potential by alternative modes to develop intercity travel forecasting model, and to forecast future intercity rail travel using different classes of rail service. As part of this study, intercept surveys were conducted at several major highways and airports throughout the state.

   Data collected from the surveys were used to develop the Total Travel and Mode Share Demand Models as shown in Figure 2. Figure 3 shows the 1992 travel market analysis results. The largest intercity travel market is the Orlando-Tampa market

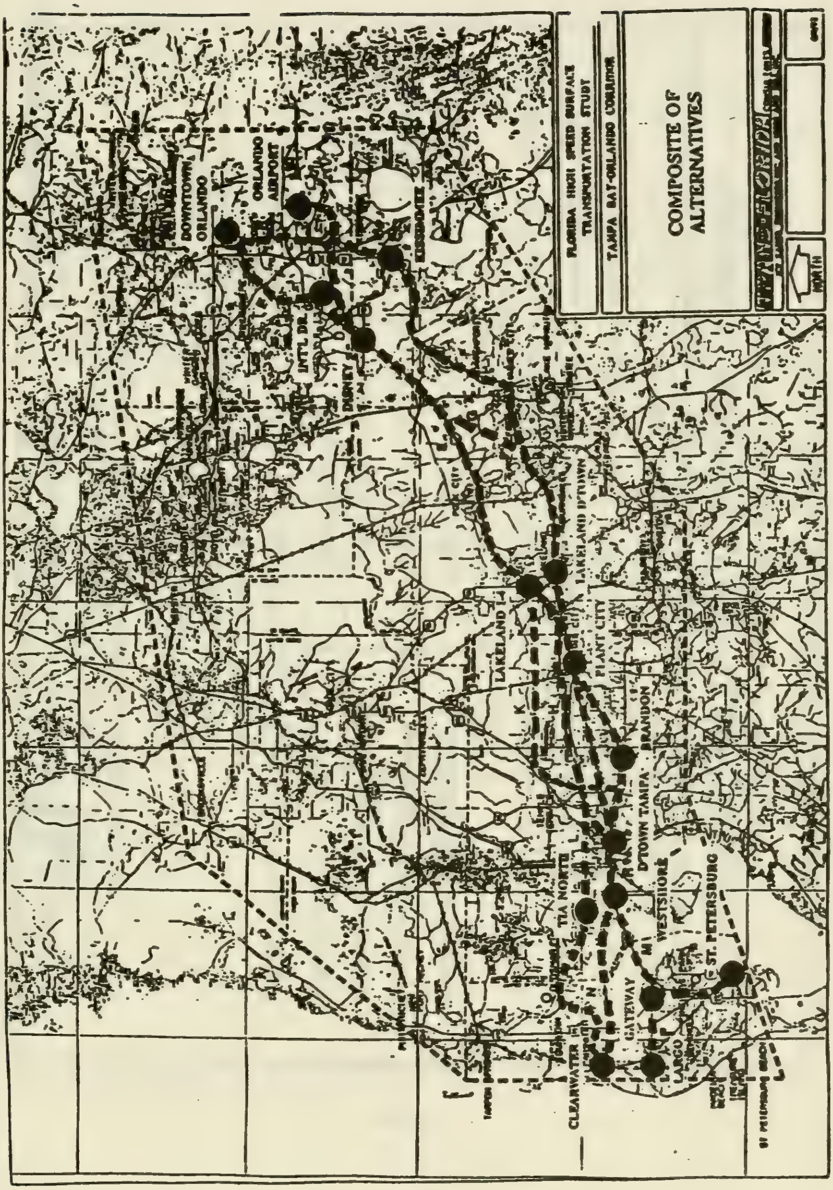
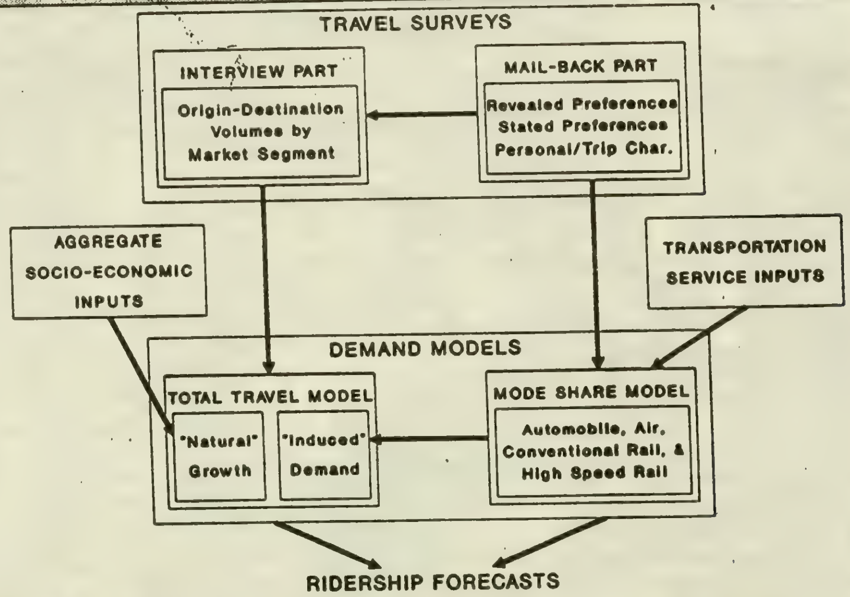

FLORIDA HIGH SPEED SURFACE TRANSPORTATION STUDY
TAMPA BAY-ORLANDO CORRIDOR
COMPOSITE OF ALTERNATIVES
NORTH
DOWNTOWN ORLANDO
ORLANDO AIRPORT
INT'L DR.
DISNEY
LAKELAND
PLANT CITY
BRANDON
D'TOWN TAMPA
WESTSHORE
TIA NORTH
CLEARWATER
GATEWAY
LARGO
ST. PETERSBURG

FIGURE 1

High Speed & Intercity Rail Market/Ridership Study

Travel Demand Analysis Approach



TRAVEL SURVEYS

INTERVIEW PART

Origin-Destination Volumes by Market Segment

MAIL-BACK PART

Revealed Preferences
Stated Preferences
Personal/Trip Char.

AGGREGATE SOCIO-ECONOMIC INPUTS

TRANSPORTATION SERVICE INPUTS

DEMAND MODELS

TOTAL TRAVEL MODEL

"Natural" Growth

"Induced" Demand

MODE SHARE MODEL

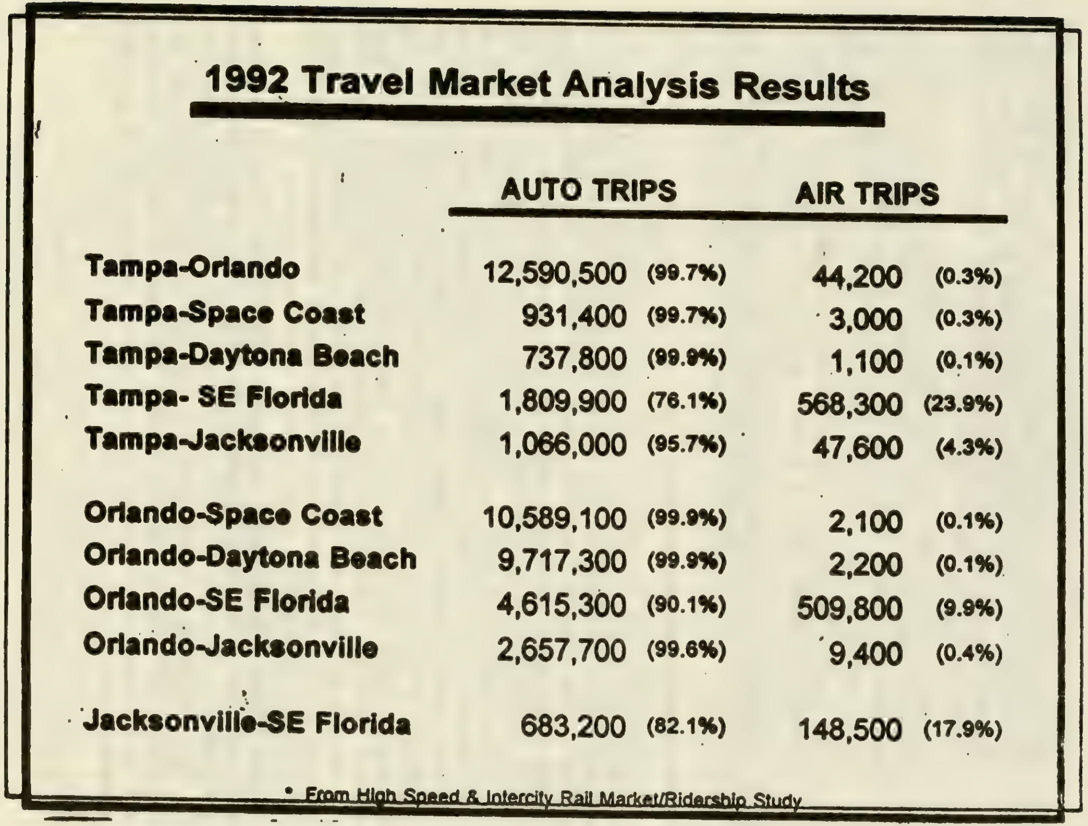
Automobile, Air, Conventional Rail, & High Speed Rail

RIDERSHIP FORECASTS

FLORIDA DEPARTMENT OF TRANSPORTATION
February 1993

KPMG Peat Marwick

FIGURE 2



1992 Travel Market Analysis Results

	AUTO TRIPS		AIR TRIPS	
Tampa-Orlando	12,590,500	(99.7%)	44,200	(0.3%)
Tampa-Space Coast	931,400	(99.7%)	3,000	(0.3%)
Tampa-Daytona Beach	737,800	(99.9%)	1,100	(0.1%)
Tampa- SE Florida	1,809,900	(76.1%)	568,300	(23.9%)
Tampa-Jacksonville	1,066,000	(95.7%)	47,600	(4.3%)
Orlando-Space Coast	10,589,100	(99.9%)	2,100	(0.1%)
Orlando-Daytona Beach	9,717,300	(99.9%)	2,200	(0.1%)
Orlando-SE Florida	4,615,300	(90.1%)	509,800	(9.9%)
Orlando-Jacksonville	2,657,700	(99.6%)	9,400	(0.4%)
Jacksonville-SE Florida	683,200	(82.1%)	148,500	(17.9%)

• From High Speed & Intercity Rail Market/Ridership Study

FIGURE 3

with 12.6 million person trips per year. As expected, the intercity travel market is dominated by the automobile mode over short distance trips while bigger portions of air trips are evident in longer distance trips such as Tampa - Southeast Florida where air trips represent about 24% of the total intercity travel for that market.

Applying the ridership models developed under this study, the annual ridership on an Orlando-Tampa high speed rail system ranged from 1.8 to 2.8 million riders depending on technology and alignment, stations served, level of service provided, and mode of access to the high speed rail stations. Applying the same models for a Miami-Orlando-Tampa system, annual ridership estimates ranged from 4.6 to 7.3 million riders.

Upon completion of these studies in the spring of 1993, the Department will begin implementation of a statewide high speed rail system in accordance with the amended high speed rail act.

Maglev Demonstration Project

In addition to its efforts to implement intercity high speed rail in Florida, the state, through the enactment of the Maglev Demonstration Project Act by the Florida Legislature in 1988, is taking a lead role in furthering the development and implementation of new high speed ground transportation technologies. The state issued a request for proposals in 1988 to solicit domestic and international companies to submit plans for what would likely be the first commercial maglev operation in the world. Responding to this request for proposals, a new Florida-based company, Maglev Transit, Inc., formed a consortium of domestic and international companies, organized around the Transrapid maglev technology and submitted a proposal for what we now call the Florida Maglev Project. Since its submittal in 1989, the MTI proposal has gone through multiple certification reviews, numerous public hearings and intense scrutiny by federal, state and local agencies to assure compliance with every aspect of developing and approving a major transportation project.

In June 1991, the Florida Governor and Cabinet issued a final certification order which authorized MTI to proceed with project development. As of March 1993, MTI has advised the Department that the partnership's financial plans are not progressing as planned and that they may request an extension of the deadlines for submission of final financial plans. Whether or not an extension will be granted will depend on the nature and extent of the MTI request.

MTI PLAN HIGHLIGHTS

If the project is built this system will provide visitors to Orlando rapid access from Orlando International Airport to the Central Florida tourist area at International Drive, 14 miles to the west. Figure 4 shows the location of this project.

More than 8 million annual passengers are projected to ride this system which will operate around the clock with 15 minute headways during peak periods. The 13.5 mile trip will take only 6.5 minutes at a top speed of 250 mph. Highlights of this proposal are as follows:

The Maglev Line

- Length is 13.5 miles.
- Single track guideway will be on an elevated structure, minimizing environmental impact on wetlands.
- Maintenance facility will be located at the International Drive end.

Technology

- Electromagnetic systems (EMS) Transrapid technology developed and tested in Germany. Operational on test track since 1983, with speed capability of 350 mph.
- Propulsion is provided by a linear synchronous motor (LSM) constructed as an integral part of the guideway.

Financing

- Total project cost of $622 million. Major private financing will be provided by Japanese investors. $97.5 million in federal funds were authorized in the Intermodal Surface Transportation Efficiency Act of 1991 for the project.
- Equity financing will be provided through an international partnership of C. Itoh, Dai-Ichi Kangyo Bank and others.
- Project developers also plan a major hotel complex at the International Drive station.

Operations

- Projected to begin in 1997.
- 24 hour operations; 4 train sets of 5 cars. Each train has seating capacity of 400; daily carrying capacity of 51,200. 128 daily one-way trips planned with a total annual ridership of 8.4 million in the first full year of operation.
- Trains operate on 15 min. headways in peak periods. 6 minute trip time between stations; maximum speed of 250 mph

Implementation Schedule

- The Department will provide public agency oversight for compliance with all certification conditions.
- The Federal Railroad Administration will have jurisdiction for safety compliance in accordance with the 1988 Railroad Safety Act.

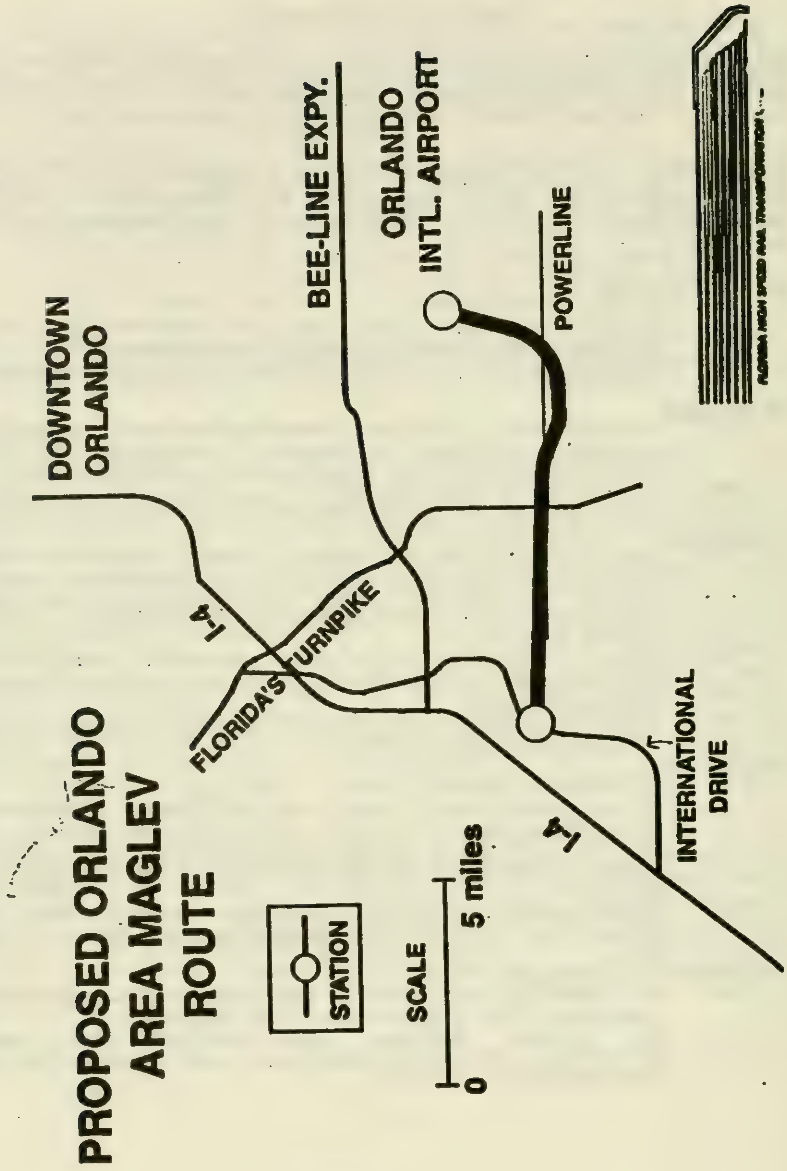

PROPOSED ORLANDO AREA MAGLEV ROUTE
STATION
SCALE
0
5 miles
DOWNTOWN ORLANDO
BEE-LINE EXPY.
ORLANDO INTL. AIRPORT
POWERLINE
I-4
FLORIDA'S TURNPIKE
I-4
INTERNATIONAL DRIVE
FLORIDA HIGH SPEED RAIL TRANSPORTATION

FIGURE 4

- Construction must begin within 3 years of certification (June 1994).
- Construction will take approximately 2.5 years.
- Vehicle operational testing can be completed in 4 months after construction is complete.
- Revenue operation must begin no later than 3 years after construction begins.

Maglev Prototype Development

Recently two US-based maglev companies have announced plans to begin development of domestic maglev prototypes in Florida. The American Magneplane consortium has initiated plans to construct a 2-3 mile test track in the Lakeland area to begin development of the superconducting Magneplane system.

The American Maglev Star consortium has issued plans to build a 20-mile revenue line connecting Port Canaveral, Kennedy Space Center and the mainland. Initially, the line will be used to develop and test a superconducting maglev technology for extension throughout the U.S.

Both these projects are being initiated with private funding, but expect to compete for the maglev prototype program authorized in Section 1036(c) of the Intermodal Surface Transportation Efficiency Act.

Florida is recognized as a pioneer and progressive center for maglev development because of its state legislative initiatives and innovative technical work over many years. The State of Florida and the private consortiums developing maglev and high speed rail look forward to working closely with other states, the federal government and private enterprise to make maglev and high speed rail a reality for the benefit of the entire nation.

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March 15, 1993

CLOSING REMARKS

Mr. **Carr**. We appreciate your time and patience. From the Committee's point of view, it has been well worthwhile.

Thank you very much. This hearing on high-speed rail is adjourned.

WEDNESDAY, MARCH 10, 1993.

THE STATE OF THE AIRLINE INDUSTRY

WITNESSES

FIRST PANEL

KENNETH M. MEAD, DIRECTOR, TRANSPORTATION ISSUES, UNITED STATES GENERAL ACCOUNTING OFFICE

FRANK MULVEY, ASSISTANT DIRECTOR, TRANSPORTATION ISSUES, UNITED STATES GENERAL ACCOUNTING OFFICE

CLIFFORD WINSTON, SENIOR FELLOW IN ECONOMIC STUDIES, BROOKINGS INSTITUTION

STEVEN A. MORRISON, PROFESSOR OF ECONOMICS, NORTHEASTERN UNIVERSITY

SECOND PANEL

EDWARD A. MERLIS, SENIOR VICE PRESIDENT, EXTERNAL AFFAIRS, AIR TRANSPORT ASSOCIATION

MICHAEL DURHAM, CHIEF FINANCIAL OFFICER, AMERICAN AIRLINES

ELLIOTT SEIDEN, VICE PRESIDENT, LAW AND GOVERNMENT AFFAIRS, NORTHWEST AIRLINES

GLEN ZANDER, CO-CHIEF EXECUTIVE OFFICER, TRANS WORLD AIRLINES

OPENING REMARKS

Mr. CARR. We'll call this session of the Subcommittee on Transportation Appropriations to order. Hopefully, Mr. Wolf will be here shortly, but because we have an ambitious hearing schedule this morning I would like to start on time and not wait for anyone. The statements have been made available to the Members.

This morning the Committee will receive testimony on the state of the U.S. airline industry and discuss ways for the Appropriations Committee to assist in addressing the industry's current problems.

The industry has lost over $10 billion over the past 3 years. Several carriers have gone out of business, and three others remain under chapter 11 protection. Only one carrier made a profit last year. The losses have continued to mount while devastating price wars caused a financial bloodletting. This cannot continue if we are to expect the domestic airline industry to be viable over the long-term.

Many suggestions have been made to deal with this problem: changes in tax policy and the bankruptcy code, removing barriers to competition, and lowering the restrictions on foreign investment have been some items mentioned. These issues were explored in depth by the Public Works Committee in hearings a few weeks ago. I do not wish to duplicate those hearings. While I'm sure we will get into some of those issues today, I would like to focus primarily on solutions which are within the jurisdiction of the Appropriations Committee.

Specifically, I hope we can find ways in which the Federal Aviation Administraion can better manage and invest its air traffic control modernization resources and its AIP funds to more directly assist the industry and the air traveller. ATC delays cost the airlines about $2 billion each year. Some have said, the FAA has developed its facilities and equipment budget with more consideration for the pursuit of technology than for service to airway users. All too often, they have approved airport development projects without adequate inquiry into the need for them.

These facilities often end up costing the airlines millions in additional rentals and landing fees. The FAA could also assist by reviewing agency regulations which can add significantly to the industry's costs.

I am supportive of the call for a presidential commission to study the industry's problems and report its findings quickly. This measure passed the House last week and awaits Senate action. I hope this hearing can provide useful input to that commission, as well as help us evaluate the FAA's fiscal year 1994 budget request.

This morning, we will hear from several distinguished witnesses, in two separate panels. On the first panel, we welcome Ken Mead and Frank Mulvey from the General Accounting Office; Cliff Winston from the Brookings Institution; and Steve Morrison from Northeastern University. Gentlemen, welcome to the Subcommittee. You may each make an oral statement, beginning with you, Mr. Mead. Then we will proceed to questions.

Please, proceed.

STATEMENT OF KENNETH MEAD

Mr. MEAD. Thank you, Mr. Chairman. This is the first time I have been able to address you in your Chair capacity.

Good morning. We appreciate the opportunity to testify. I will summarize our statement.

We have completed a considerable body of work over the past several years on airline competition, the financial condition of the industry, and various FAA programs that affect the airlines' operating efficiency and operating costs.

These reports in front of me all deal with what you suggested be the focus of the hearing today. Much of this work was done at the request of this subcommittee. Our testimony today will build on a statement we gave several weeks ago before the House Public Works Committee, but we want to emphasize the role that the use of budgetary resources by FAA can play in helping this troubled industry.

Our basic points are the following:

As you know, every major scheduled passenger carrier, except Southwest, has experienced substantial losses. They have been especially severe for the weakest airlines. The five major airlines that have failed or are operating under bankruptcy protection have seen their share fall from about 35 percent in 1987 to less than 18 percent in 1992. At the same time, the Big Three airlines have increased their share from 41 percent to almost 58 percent.

While the root causes of the airline industry's financial and competitive problems involve more systemic issues, FAA's efficient and effective use of budgetary resources clearly could have a positive influence on the industry's operating costs.

Where can FAA contribute the most? The areas where FAA can contribute the most include modernizing the air traffic control system, maintaining adequate work forces with sufficient expertise and deploying them to the areas of greatest need, and improving airport access and operations in connection with the airport improvement grant program. FAA performance shortfalls in any of those areas can increase the industry's operating costs.

There is room for significant improvement by FAA in each of those areas. I will take each of those three areas one at a time, with modernization first.

This is a $32 billion air traffic control modernization program. Among other things, it is expected to provide the airlines with more efficient routings, reducing flight and ground delays, and thereby helping the airlines save fuel and other operating costs, and presumably ultimately benefitting the consumer.

FAA has projected over the years varying levels of benefits from this program. I am going to use their benchmark estimate of over $200 billion.

Most of those benefits have been postponed. Why is that? That is because key components of the program, including its centerpiece, the Advanced Automation System, have experienced not only multibillion dollar cost increases, but on average they have had schedule slip-pages of about 5 years, some even more than that.

For the past several years, FAA has been implementing numerous procurement reforms. We and the subcommittee have recommended many of them. These procurement reforms will address the underlying problems that have led to the cost increases and schedule slippages.

What do these reforms include? They include efforts on a broad front to better justify systems in the first instance, establishing just what the benefits are for the airline industry, coming to closure with contractors on requirements sometime in the early stages of the contract, thinking through the projects and even alternatives to the project early in the stages of acquisition, avoiding premature commitments to production, and so on.

I don't think it is intuitively obvious to everybody that this modernization program is not just to benefit FAA. In fact, most of the benefits projected are for the industry and ultimately the consumer.

These reforms are far from being fully implemented. Their chief value will be in fact for newer projects, not those projects that have been underway for 9 or 10 years, although hopefully these reforms, once they are established, will minimize further slippages.

I would like to move to the workforce for a moment. FAA also has opportunities to improve the efficiency of air traffic control operations and the maintenance of those operations by making judicious staffing decisions. Example: some air traffic control facilities are over-staffed and some are under-staffed. We have been reporting for some time that FAA needs to assign controllers to where they are needed the most.

The issue several years ago was the size of the controller workforce. That is no longer an issue. The controller workforce is largely rebuilt. It is the distribution of the controllers that is at issue.

The situation with the maintenance technician workforce—these are the people who maintain the system, prevent outages—is quite different. Due to slippages in the modernization effort, FAA must work harder to maintain old equipment—much longer than expected. But the experience level of its staff has declined greatly, mean time to do repairs has increased, backup and equipment component failures are increasing.

The FAA is trying to rely on contractors and overtime to keep the system reliability high. We are now examining what options FAA is trying to pursue in the maintenance workforce area.

I would like to move to a third area, which is the grant program. FAA and the Congress have an opportunity to leverage this $2 billion annual budget in ways that could be very important to the industry and the travelling public. We have reported that FAA's 10-year national plan for airport development, which contains about $40 billion in proposed development projects, is really not what its title suggests. It is not that useful as a plan. It is more a listing of projects that airports across the country would like to do than a plan for action.

It provides no measurable goals or objectives, such as reducing total flight delays. It provides no options. And it offers decisionmakers little guidance for making funding choices among competing projects.

On the basis of our work on several major airport development projects, FAA will need much better data and methods to judge how best to leverage airport improvement grant funds. As a matter of fact, Congress has directed them to do this as far back as 1987.

It should be recognized, though, that while improvements in the modernization program and the airport grant program are important and can reduce industry operating costs, the problems in those programs are not the primary reason for the industry's financial and competitive problems. The financial problems are much more deep-seated. I don't want to dwell on those, but I would like to mention them.

There isn't any single factor that explains all the losses. You have high debt service costs and enormous debt/equity ratios. These have resulted in part from leveraged buy-outs. Excess capacity, limited access to capital, and fare wars have all contributed to the financial problems. The effect of these factors, of course, was exacerbated by the recession and the Persian Gulf War.

Also, some analysts have pointed to airline pricing practices, especially those of the bankrupt airlines. I would be careful in this area and I believe Messieurs Morrison & Winston seated here at the table will be addressing this issue later.

Also, as we reported previously, there are physical and marketing barriers to domestic competition. These include long-term exclusive use leases at airports. That is, one airline has a lease on a gate for, say, 30 or 40 years. If you want to use that gate, you have to lease it from that airline. Computer reservation services, code sharing, travel agent incentives, frequent flyer plans, and slot allocations have impacts as well. We did an analysis a couple of years ago of fares on 1,600 routes in this country where these barriers were present. All of these factors had an influence on airline fares.

Mr. Chairman, we concur with you that a national commission to promote a strong and competitive airline industry would be a good vehicle for at least devising a strategy for dealing with the areas I have alluded to. I think FAA, for its part, ought not to await the results of a commission. These are areas that we and the committee have been reporting on for many years.

I think I will conclude with that.

[The prepared statement of Kenneth Mead follows:]

United States General Accounting Office

GAO

Testimony

Before the Committee on Appropriations
Subcommittee on Transportation
and Related Agencies
House of Representatives

For Release on Delivery
Expected at
9:00 a.m. EST
Wednesday
March 10, 1993

STATE OF THE AIRLINE INDUSTRY

Strategies for Addressing Financial and Competition Problems

Statement by Kenneth M. Mead,
Director, Transportation Issues
Resources, Community, and Economic
Development Division

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to testify on the state of the airline industry and the role that the efficient and effective use of budgetary resources by the Federal Aviation Administration (FAA) can play in helping this troubled industry. On February 18, 1993, we testified on the financial problems facing the airline industry before the Subcommittee on Aviation, House Committee on Public Works and Transportation. In that testimony we outlined some of the strategies that the Congress could pursue to help improve the financial health of the airlines and strengthen competition. Our testimony today builds on that statement and draws on an extensive body of work over the past several years on the state of competition in the airline industry and on the progress of FAA's airport and airways modernization programs. A bibliography of that work is attached to our testimony.

Our basic points are the following:

-- Nearly all the major U.S. airlines have sustained serious losses over the last 3 years, but these losses have been especially severe for the financially weakest airlines. The five major airlines that have failed or are operating in bankruptcy have seen their market share fall from about 35 percent in 1987 to less than 18 percent in 1992. At the same time, the three largest airlines have increased their market share from 41 percent to almost 58 percent.[1]

-- No single factor can explain all of the airlines' financial problems. High debt-service costs resulting from leveraged buy-outs, ill-timed expansions and excess capacity, limited access to capital,[2] and fare wars have all contributed to the losses. The recession has exacerbated the industry's financial condition. The pricing practices of bankrupt airlines whose fares may not cover all of their costs of operations because of bankruptcy court protection practices are also alleged to be a factor undermining the financial condition of the industry. In addition, physical and marketing barriers to competition, such as restricted access to key airports and computerized reservation systems (CRS), have made it difficult for the smaller and financially weaker airlines to compete, especially in markets dominated by the largest airlines.

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[1] The five airlines are Eastern and Pan Am (which ceased operations in 1991) and America West, Continental, and TWA (which are reorganizing under bankruptcy court protection). The three largest airlines are American, United, and Delta. Market shares are based on systemwide revenue passenger miles.

-- Although the root causes of the airline industry's financial and competitive problems involve the more systemic issues noted above, FAA's efficient and effective use of budgetary resources can have a positive influence on airline operating costs. The areas where FAA can contribute the most include modernizing the air traffic control system, maintaining adequate workforces and deploying them to areas of greatest need, and making wise investments to improve airport access and operations. FAA performance shortfalls in any of these areas can increase the industry's operating costs. We have found that FAA needs to improve its performance significantly in each of these areas.

FAA's $32 billion air traffic control modernization program, for example, has experienced serious schedule slippages and multi-billion dollar cost increases. As a result, the airlines and the flying public will not realize the billions of dollars in benefits FAA projects for many years. Furthermore, FAA's national plan for airport development lacks measurable objectives and offers little guidance for making funding choices among competing projects. We have made numerous recommendations to FAA on ways to improve these programs; full implementation of the recommendations would yield benefits to the industry and the consumer. Addressing the problems in these programs would help reduce airline operating inefficiencies, such as flight delays, and this, in turn, would affect airline and consumer costs. There are, however, other more basic reasons that underlie the airline industry's financial difficulties and competitive problems.

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[2] A major limitation on U.S. airlines' access to capital is the restriction on foreign investment and control.

-- Just as no single factor explains the current state of the industry, no single action will address its interrelated financial and competitive problems. Thus, the challenge will be for the Congress and the new administration to work with the industry toward a broad and well-designed strategy that combines efforts to reduce entry barriers with efforts to create a more efficient infrastructure. One possible vehicle for developing such a strategy would be the National Commission to Promote a Strong and Competitive Airline Industry.[3] In our opinion, such a strategy would be most effective if it contained four key elements: (1) improving U.S. airlines' access to capital markets through relaxing the restrictions on foreign investment and control, under certain conditions; (2) enhancing access to the growing international market for all U.S. airlines; (3)

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[3] This commission was authorized by the Congress in October 1992 to examine current conditions in the airline industry and suggest possible strategies for addressing its problems.

reducing barriers to competition; and (4) examining the claims and counterclaims about airline pricing practices, especially those of bankrupt airlines.

We would now like to discuss in more detail the competitive and financial problems of the airline industry, as well as the areas where FAA can use its budgetary resources more effectively to improve the operating efficiency of the industry.

THE INDUSTRY'S CURRENT FINANCIAL PROBLEMS MAY REDUCE FUTURE COMPETITION

The major U.S. airlines have lost over $10 billion in the last 3 years. (See app. I, table I.1.) However, that aggregate figure is skewed by the huge losses suffered by a few airlines. For example, about two-thirds of the industry's 1990 and 1991 losses were recorded by Eastern, Pan Am, and Continental. Among the airlines reporting full-year financial results for 1992, about half of the losses reported are due to the new Financial Accounting Standard (FAS 106), which changes the way retiree medical and life insurance benefit costs are recorded. (See app. I, table 1.2) In addition, some of the losses reported by the three largest and strongest airlines (American, Delta, and United) stem from the costs associated with integrating the assets they have purchased from their bankrupt rivals in the last few years. For example, Delta's 1992 operating expenses rose more than 20 percent from calendar year 1991, largely because of the costs associated with the takeover of Pan Am's European operations.

In response to their losses, the major airlines have been implementing cost-cutting programs, laying off employees, cancelling or delaying aircraft deliveries, and refocusing service. For example, TWA reduced overall capacity by almost 20 percent between 1990 and 1992, and USAir closed its Dayton, Ohio, hub. While such actions should help the industry improve its financial performance, they can have negative impacts on an airline's long-term competitive position. For example, cancelling or delaying aircraft deliveries can reduce current capital spending but can also limit future service options because of airport noise reduction programs that restrict the use of older, noisier aircraft.

Financial Problems Weaken Competition and Reduce Profitability

Both GAO and the Department of Transportation (DOT) have found that consumers pay higher fares when flying from airports where there is little competition. In our analysis of 1988 fares,[4] we found that fares for flights from concentrated airports were about 20 percent higher than for trips of similar lengths from other airports.[5] We are updating this study and the results should be available this spring. DOT reported that fares at a group of eight airports dominated by one airline were about 19 percent higher than average fares in 1988.[6] A recently released DOT study of 1991 fares showed no change in this premium. While most routes continue to be served by several competitors, if the industry continues to consolidate, the decrease in competition could lead to higher fares.

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[4] Airline Competition: Higher Fares and Reduced Competition at Concentrated Airports (GAO/RCED-90-102, July 11, 1990). Our study compared fares on the basis of yield, i.e., fare per passenger mile.

[5] We classified an airport as concentrated if one airline handled at least 60 percent of the passengers enplaning at that airport, or two airlines handled at least 85 percent of the enplaning passengers. We excluded airports in metropolitan areas served by more than one commercial airport, such as New York City and Chicago, and airports outside the contiguous 48 states.

[6] In the DOT study, airports were classified as concentrated if one airline enplaned 75 percent or more of the passengers.

Since January 1990 two major airlines have ceased operations and three more are reorganizing under bankruptcy court protection. The financially weaker airlines have also sold more than $2 billion worth of assets, primarily international route rights and slots,[7] to their stronger competitors. (See app. II.) The market shares of the five bankrupt major airlines have fallen from 35 percent in 1987 to less than 18 percent in 1992. During that same period, the market share of the three largest airlines has grown from about 41 percent to almost 58 percent.

Over the past decade, several large airlines have developed serious problems that weaken their financial positions. Chief among these problems are the high levels of debt some airlines have incurred to finance leveraged buy-outs and expansion plans and the operating and marketing practices that raise the costs of competing with the dominant airlines in a market. The five major airlines in financial trouble in 1990--America West, Continental, Eastern, Pan Am, and TWA--all experienced substantial increases in their debt ratios (i.e., long-term debt as a percentage of total capitalization) during the 1980s. All of those airlines had average debt ratios over 80 percent. In contrast, the other six major airlines all held their debt ratios under 65 percent, and most of them held their average debt ratios under 50 percent in 1985-89. (See app. IV.)

In the future, airlines will have to spend billions of dollars to repair and modify older aircraft to ensure safety and reduce noise. For example, we have estimated the industry's cost of retrofitting or replacing noisier Stage 2 aircraft to be between $2 billion and $5 billion dollars.[8] In addition, airlines must finance the acquisition of new aircraft if they are to remain competitive.

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[7] A slot is a reservation for take-off or landing at one of four U.S. airports where access is restricted under the High Density Rule (14 C.F.R. Part 93, Subpart K).

Many factors affect the profitability of the airline industry and of individual airlines. Demand for air travel is sensitive to swings in the level of economic activity and to unexpected events, such as the increased concern about air travel safety during the Persian Gulf War.

For more than a decade, profit margins in the U.S. airline industry have been about half those of the average U.S. company in other industries, and airlines have had to borrow or sell stock to raise capital. Debt financing, whether through issuing debt instruments such as bonds or through the sale-leaseback of aircraft, carries fixed charges for interest, principal, and lease payments. In a cyclical industry like the airline industry, revenues available to cover fixed charges may fluctuate widely, making it difficult to cover fixed charges during cyclical downturns in demand or short-term increases in costs. Another way to raise additional capital is to sell stock. However, because of their low returns, the weaker U.S. airlines are not likely to attract much additional equity investment from U.S. sources. Therefore, the most likely investors are foreign airlines, because they can capitalize on operating synergies between the two airlines, something nonairline investors cannot do.

Some industry observers believe that the actions of certain bankrupt airlines may have also affected profitability. Because bankrupt firms can suspend repayment of long-term debt, they may set prices to generate sufficient cash flow to meet short-term needs, rather than setting prices that cover the full costs of operation.[9] To remain competitive, the other airlines would have to respond by matching these low fares and, as a result, suffer losses.

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[8] Aviation Noise: Costs of Phasing Out Noisy Aircraft (GAO/RCED-91-128, July 2, 1991), p. 2. Our estimate reflects the present-value cost to the industry in 1990 dollars.

However, it is true that the airline industry has often experienced excess capacity during economic downturns. Because the airline product--a seat-mile of service--cannot be stored, but is instead lost as soon as the plane takes off, the airlines are under pressure to fill their seats, as long as the fare covers the marginal cost of providing the seat. This behavior can also lead to fares below full cost, which can erode industry profit margins.

FAA ACTIVITIES AFFECT AIRLINE OPERATING EFFICIENCY AND INDUSTRY COSTS

While the root causes of the airline industry's financial and competitive problems involve more systemic issues, FAA's efficient and effective use of budgetary resources can have a positive influence on the industry's operating costs. FAA's Acting Administrator recently said that air traffic delays impose annual costs on the nation's airlines and air travelers of $3 billion and $7 billion, respectively. The areas where FAA could contribute most include modernizing the air traffic control system, maintaining adequate workforces and deploying them to the areas of greatest need, and making improvements to the airport grant program to relieve congestion and delays. FAA's performance in all of these areas needs improvement.

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[9] The full costs of operation would include, for example, the costs of financing aircraft.

Air Traffic Control Modernization Should Help Airlines Operate More Efficiently, but Billions in Benefits Have Been Deferred

We have reported extensively on FAA's $32 billion air traffic control modernization program. This program is intended to, among other things, allow the airlines to fly more efficiently, and thereby save fuel, crew, and other operating costs. FAA has projected over $200 billion in benefits from air traffic control modernization, but few of these benefits have been realized. Key components of the program have experienced multi-billion dollar cost increases and serious schedule slippages of about 5 years. The estimated cost of the program's centerpiece-the Advanced Automation System--rose from $2.5 billion in 1983 to a current estimate of $5.1 billion. Completion of the project was originally scheduled for 1996; the current estimated completion date is 2002. FAA has been implementing numerous procurement reforms to address the underlying problems that have led to the schedule slippages. These reforms include efforts to better justify the need for systems in the first place, establish the expected benefits for the airline industry, define the requirements of the project in the early stages of the acquisition and avoid premature commitments to production. These reforms are far from fully implemented, however, and their chief value will be for newer projects and, hopefully, to prevent further slippages for the older projects.

Also, we believe that FAA could do more to develop ATC systems that meet the needs of the airlines. First, as we reported to this Subcommittee in January 1993, FAA must do a better job of defining its own and the industry's needs. We identified numerous instances where project justifications contained no qualitative or quantitative information explaining what performance problem was to

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[10] Air Traffic Control: Justifications for Capital Investments Need Strengthening (GAO/RCED-93-55, Jan. 14, 1993)

be fixed, or the extent to which a new investment could be expected to reduce delays or enhance capacity. For instance, FAA does not always use its information on airspace and airport delays when deciding on investments in system capacity. Also, in our November 1992 report on precision landing systems, we found that FAA had not done a runway-by-runway analysis to justify where upgraded landing system capabilities would be needed to reduce delays.[11] Second, FAA must carefully consider alternatives to meeting the air traffic control system's needs. In assessing alternatives, costs to the airlines are essential considerations. Our report on FAA's acquisition of precision landing systems noted that airlines are installing satellite compatible avionics to support aircraft operations during all phases of flight. If a satellite-based system can be used for precision landings, airlines may avoid spending between $252 million and $336 million on microwave landing system avionics.

FAA's Workforces Can Also Affect Airline Operating Efficiency

FAA also has opportunities to improve the efficiency of air traffic control operations and the maintenance of that system by making judicious staffing decisions. As we have been reporting for some time, FAA needs to assign controllers to where they are needed most. The controller workforce is largely rebuilt, but the distribution of controllers is less than optimal. Adequate controller staffing of air traffic facilities plays a key role in an efficiently-run air traffic system. According to data developed by FAA officials performing a facility-by-facility analysis of controller staffing, more than 200 terminal facilities were understaffed in May 1992, while more than 150 facilities were overstaffed. Similar problems exist in the en route centers. An improperly staffed facility can affect aircraft spacing and distances and cause extended holding patterns and holdover times at congested facilities. These problems have resulted in aircraft delays at a cost to the industry. FAA has been working to lessen the burden on the industry by implementing a central control facility that shifts the problem from the skies to the ground with the advantage of saving the industry considerable fuel.

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[11] Airspace System: Emerging Technologies May Offer Alternatives to the Instrument Landing System (GAO/RCED-93-33, Nov. 13, 1992

The maintenance technician workforce--the people responsible for maintaining the system and preventing outages--poses a different problem. Due to slippages in the modernization effort, FAA must maintain old equipment much longer than expected and, in some cases must maintain a number of dual systems concurrently. In addition, the work force experience level has declined substantially as more journey-level technicians retire and are replaced by developmental personnel. According to FAA, today's technician has less than 10 years experience, while a technician three years ago may have had over 25 years. In order to meet the increased work load with a less experienced work'force, FAA has relied more on contractors to maintain new equipment, increased overtime usage, and reduced maintenance coverage at some facilities. Although equipment redundancy has kept overall system availability very high, backup system failures are increasing and outages are more lengthy. Due to the importance of system reliability to industry operations and safety, we are currently examining FAA strategies to accommodate maintenance technician shortages.

Moreover, we reported recently that the lack of common international certification standards for the design of aircraft creates a heavy burden on U.S. aircraft manufacturers and airlines without a corresponding increase in safety.[12] Despite FAA certification staff efforts to eliminate differences over the last decade, manufacturers continue to spend millions of dollars to obtain foreign approvals to export their aircraft after FAA has already certified the aircraft as safe. These costs are often passed directly to the airlines. In turn, airlines often spend millions of dollars to modify aircraft already in service to obtain foreign certifications. Manufacturers estimate that eliminating such differences would save the domestic industry up to $1 billion over the next 10 years. Also, FAA estimates that airlines can save many times that amount if differences in operating and maintenance regulations between FAA and other nations are eliminated. Although FAA realizes that eliminating such differences would improve the financial condition of U.S. airlines, little progress has been made since 1983 when FAA and the European Community initiated an effort to eliminate these differences. Lack of a clear strategy, as well as questions of sovereignty have prevented FAA from achieving progress. As a result, we recommended that FAA develop such mechanisms as joint certification teams with the European Community to help prevent late design changes and eliminate duplication during the certification process.

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[12] Aircraft Certification: Limited Progress on Developing International Design Standards (GAO/RCED-92-179, Aug. 20, 1992)

More Strategic Approach in Funding Airport Improvement Grants Could Improve Airline Industry Efficiency

FAA and the Congress have an opportunity to leverage the almost $2 billion annual budget for the Airport Improvement Program (AIP) in ways that could be very important to the industry and the travelling public. As air traffic recovers, congestion problems could worsen at some major airports--increasing airline operating costs. AIP funding could be used more effectively to enhance capacity at airports or at nearby reliever airports and alleviate congestion.

As we have reported, however, FAA's 10-year national plan for airport development--which includes a total of $40 billion in proposed projects--lacks a set of measurable goals by which to assess the effectiveness of its spending and is considered a "wish list" by many in the aviation community. Goals would set expectations for the plan as well as establish a basis for measuring its performance. Although a number of policy statements govern FAA's funding of airport improvement projects, none is stated in quantitative terms or applied to the planning process. Without ways to measure project performance, such procedures provide decision makers with little guidance for making funding choices among competing projects. On the basis of our work on several major airport development projects, FAA will need better data and analytic methods for judging how best to leverage airport improvement grant funds to best assist the industry and benefit the travelling public.

Despite the fact that AIP funds are limited, for example, an FAA-funded study of alternative sites for a new Chicago airport assumed that 20 percent of eligible construction costs would be paid out of AIP. One of the 5 sites reviewed (and the one favored by the selection committee) would have required more than $3 billion from the AIP fund, an amount that would sharply reduce federal support for projects at other airports. The situation in Colorado offers another example. After committing $500 million to the new Denver airport, FAA was considering investing in an all-cargo facility only a few miles away that would have taken traffic and needed revenues from the new airport. This may have increased costs for airlines operating out of the new Denver airport and for the travelling public as well.

The financial problems faced by the industry would be somewhat ameliorated by the more efficient use of budgetary resources by FAA. However, the more systemic problems undermining the competitive and financial health of the industry also must be addressed.

STRATEGIES FOR ADDRESSING AIRLINE FINANCIAL AND COMPETITIVE PROBLEMS

We believe that the most appropriate approach to resolving the competitive and financial problems of the airline industry is to focus on strategies that address the multiple factors that have led to the current problems. Airlines' access to capital needs to be improved, possibly by relaxing restrictions on foreign investment and control. However, improved access to capital is not a panacea for the airlines' financial and competitive problems. Access to international markets also needs to be enhanced, and the relaxation of U.S. restrictions on foreign investment could be linked to gaining better access for U.S. airlines to international markets. In addition, a number of barriers to competition resulting from airline marketing and operating practices continue and must be reduced if competition is to thrive. Finally, claims about unfair pricing practices need to be carefully examined before any action is taken to "protect" the airlines.

Improving Airlines' Access to Capital

U.S. airlines have not generated an attractive rate of return in recent years and, as a result, must either sell equity or borrow or to finance capital needs. However, borrowing raises fixed costs for debt repayment and many airlines already have heavy debt loads. Moreover, because of low rates of return, the most likely investors in the financially weaker U.S. airlines are other airlines that can capitalize on operating and marketing synergies. The continuing consolidation within the U.S. airline industry may mean that further mergers between U.S. airlines could have a difficult time clearing the Justice Department's antitrust scrutiny. The most likely investors, therefore, are foreign airlines that could link the domestic and international operations of the U.S. airline with their own route systems. For example, DOT recently approved Air

Canada's investment in Continental, and USAir and British Airways have announced a modified version of their previous investment agreement, which was withdrawn last December.

We have examined the issue of foreign investment in some detail.[13] Federal law currently limits foreign investment in U.S. airlines to 25 percent of the airline's voting stock. In addition, the president and two-thirds of the airline's board of directors, and key management officials must be U.S. citizens. DOT interprets the law to require that effective control must also remain in the hands of U.S. citizens. Some of the reasons that the restrictions were first put in place, such as protection of a heavily subsidized, fledgling industry, are no longer a concern. Allowing greater foreign investment could help some U.S. airlines remain viable competitors, thus enhancing domestic competition. However, other concerns remain.

On the one hand, foreign airlines are not likely to invest substantially in U.S. airlines, particularly the weaker ones, unless they can (1) exercise control over their investment commensurate with the amount of voting stock held and (2) integrate the operations of the two airlines into one system. On the other hand, U.S. airlines that already have significant international operations are concerned that allowing a foreign airline to gain control over a U.S. airline could place them at a competitive disadvantage, especially if the investing foreign airline is from a country that has a particularly restrictive bilateral agreement.

There are other issues in the debate on foreign investment and control as well. The Department of Defense is concerned about the continued availability of commercial aircraft and crews to supplement its own airlift capacity in times of military emergency

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[13] Airline Competition: Impact of Changing Foreign Investment and Control Limits on U.S. Airlines (GAO/RCED-93-7, Dec. 9, 1992).

Airline labor unions are concerned about potential job losses, especially high-paying crew jobs on international flights, if foreign airlines are allowed to gain effective control over U.S. airlines.

Our analysis of the likely impacts of changing foreign investment and control limits showed that these interests and concerns could be addressed. If the Congress chooses to relax the limits on foreign investment and control of U.S. airlines, DOT could be required to proactively consider potential impacts on international aviation competition in assessing the proposed investment, and eligibility to make such investments could be limited to airlines from nations that are willing to exchange improved access to their markets. The Congress could also expand DOT's review of these transactions to consider their potential impact on national security. We also suggested that our examination of potential job impacts concluded that there are practical limits to the number of jobs that might be lost and that U.S. airline employees are highly cost-competitive with their international counterparts. Finally, the potential for jobs to be lost if an airline ceases operations because it cannot get the capital needed to stay afloat is likely to be much greater than any losses associated with increased foreign investment and control.

Domestic Issues Should Be Considered in the Context of the Changing International Environment

The second element of the strategy is enhancing access to international markets. The international aviation industry, like the domestic industry, has been changing. The international market is expected to grow about twice as fast as the domestic market through the year 2000. Thus, the major U.S. airlines have begun to focus greater attention on expanding their international operations. Between 1987 and 1991 the proportion of major U.S.

airlines' systemwide revenue passenger miles represented by international operations grew about 22 percent, and international operations now account for about 26 percent operations. (See app. III.) For the three largest major airlines, the growth in international operations has been dramatic, with international revenue passenger miles more than doubling between 1987 and 1991.

Access to international markets is regulated by bilateral agreements between governments that set the conditions under which U.S. and foreign airlines operate and compete. These agreements, known as bilaterals, can restrict competition by limiting the services and fares that can be offered. The United States has 72 bilaterals with 95 countries around the world, each one separately negotiated. Although the European Community (EC) has integrated its internal market, the European Commission does not yet negotiate aviation issues for the 12 EC member nations as a whole. While the United States can mandate change in the domestic industry, it can influence, but cannot dictate, the pace of international change. Change in the international arena is likely to be slow because of the many bilaterals in place and the necessity of negotiating changes with each country individually under the current system. We believe that an examination of U.S. policy, to ensure that it encourages greater international competition, protects the interests of consumers, and allows all U.S. airlines to participate in international markets, would be useful.

Also, while some industry analysts believe that the system of bilaterals will be replaced by a more open, competition-oriented system, the results of recent negotiations with our aviation trading partners are mixed. For example, within the past year the United States had concluded an open-skies bilateral with the Netherlands, but several other countries--France, Germany, and Japan--have requested changes to their bilaterals, such as temporary capacity constraints, that would place additional limits on competition. In addition, many industry officials and analysts believe that the current consolidation in the U.S. airline industry is the precursor of a global trend, leading to the eventual domination of worldwide aviation by a handful of mega-carriers. Thus, many U.S. and foreign airlines have been developing networks of equity and marketing alliances to improve access to each others' international and domestic markets and thereby improve their chances of surviving the expected restructuring.

An airline's financial condition affects whether it can continue to participate in international markets and how it can participate. The financially distressed airlines have sold international routes, and some have reduced their participation in the international market, while the stronger U.S. airlines have expanded their international operations. In addition, some of the smaller or financially weaker U.S. airlines have had to rely on marketing agreements with foreign airlines to continue or expand their participation in some international markets. Thus, U.S. airlines must be financially sound if they are to continue to play a significant role in international markets.

Barriers to Competition Limit Market Entry and Raise Fares

The third element of the strategy is addressing the barriers to competition on which we have reported and testified extensively. Airline operating and marketing practices make it more difficult for some airlines to compete by limiting access to airports and by limiting the ability of new airlines on a route to market their services. These practices also affect airline profitability by raising the costs of competing airlines. When entry into markets is constrained, competition is reduced. In our 1991 report,[14] we found that fares were 5 to 9 percent higher on routes when two or more of these barriers were present. We have previously presented a number of options for addressing these barriers, which we will summarize today.

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[14] Airline Competition: Effects of Airline Market Concentration and Barriers to Entry on Airfares (GAO/RCED-91-101, Apr. 26, 1991).

Certain Practices Limit Access to Airports

Airport access is limited by the practice of leasing airport gates and other facilities to airlines on long-term, exclusive-use leases. These leases give control of key airport facilities to airlines and make it possible for them to exclude other airlines from using the facilities. Federal government action to encourage the use of preferential-use leases on airport facilities could help improve access to the terminal facilities an airline needs to offer service.[15] Since new facilities built with Passenger Facility Charges (PFC) cannot be leased on long-term, exclusive-use leases, the 1990 PFC legislation clearly moved in that direction.[16] As of November 1992, this legislation has made more than $75 million available for terminal expansion projects that could increase competition.

Another factor limiting airport access is the FAA's High Density Rule, which restricts access to take-off and landing slots at four key airports--Washington's National, Chicago's O'Hare, and New York's Kennedy and La Guardia Airports. Competition at the slot-controlled airports could be enhanced if slots were made available to airlines with little or no service at those airports. The limits on operations at the slot-controlled airports were designed to tailor demand for air traffic services to the capacity of the airports. However, technical improvements in air traffic control may make it feasible for FAA to increase the number of slots available at those airports. In addition, the buy/sell rule, which was designed to create a market in slots, could be altered to encourage airlines to sell slots they do not use.

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[15] A preferential-use lease protects the primary lessee's right to use the facilities whenever the airline has operations scheduled, but allows the airport to make the facilities available to other airlines when the facilities would otherwise be idle.

[16] PFCs were authorized in sec. 9110 of the Aviation Safety and Capacity Expansion Act of 1990, which was signed by the President on November 5, 1990.

Marketing Practices Limit the Ability of Airlines Entering New Markets to Compete

Certain airline marketing practices also limit competition. These practices include computerized reservation systems (CRS), travel agent incentives, frequent flyer plans, and code-sharing.

CRSs and Travel Agent Incentives--Because each airline must, as a practical matter, have its flights listed on each CRS in order to market its flights successfully, each airline must pay the booking fees charged by the other airlines that own the CRSs. As we reported in 1991,[17] the lack of effective competition in the CRS industry allows the dominant CRSs, which are controlled by American and United, to each receive substantial revenues, in excess of the costs of the service provided (including a reasonable profit),[18] from other airlines in the industry, most of which are financially weaker. Travel agent commission overrides may also restrict competition.[19] Commission overrides and other travel agent incentives encourage agents to divert traffic to the airline offering the best incentives, usually the largest in the market, when the passenger's needs can be met by the services of more than one airline.

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[17] Airline Competition: Weak Financial Structure Threatens Competition (GAO/RCED-91-110, Apr. 15, 1991).

[18] Based on data collected by DOT for its 1988 study of the CRS industry, we calculated that the two dominant CRSs annually transferred over $300 million to their airline owners. Although we recommended that DOT update its information on the CRS industry, DOT has not gathered more recent data.

[19] Commission overrides are bonus commissions paid by individual airlines to travel agents to encourage booking on a particular airline.

DOT issued new CRS rules in September 1992 that addressed the concerns we have raised in the past about the contractual relationships between travel agents and CRS vendors. These concerns included minimum-use clauses, automatic rollovers, and 5-year minimum contract terms. The new regulations should make it easier for travel agents to change systems. However, DOT did not address the problem of booking fees. Eliminating or reducing booking fees would halt or reduce the revenue transfers from participating airlines to CRS vendor airlines. Although such a strategy could raise the cost of the systems for travel agents, travel agents are in a better position to negotiate terms with the vendors than are the airlines that, as a practical matter, must participate in every system. Alternatively, requiring arbitration of increases in booking fees could give participating airlines some leverage and help minimize revenue transfers. In addition, eliminating commission overrides and other travel agent incentives could reduce agents' tendency to book on the dominant airline in a market. However, policies to eliminate the adverse effects of CRSs on competition should be designed to preserve their positive features. Consumers benefit from CRSs because the systems allow travel agents to quickly search among the fare, route, and schedule offerings of competing airlines to find the flight that best meets the passenger's needs.

Frequent Flyer Plans--Frequent flyer plans may also have a significant effect in reinforcing the market power of dominant airlines. Our survey of travel agents indicated that business flyers often choose an airline on the basis of frequent flyer plans, which generally favor the larger airlines in each market. The aspects of frequent flyer plans that reinforce the market power of dominant airlines could be reduced without eliminating the plans. For example, making mileage transferable between passengers belonging to the same plans would reduce passengers' incentives to fly only with the dominant airline in a market, but airlines and travelers would still benefit from the plans. Benefits would occur because passengers must still take flights on an airline to earn awards from that airline, but the passengers do not have to concentrate their travel on a single airline if they can trade mileage earned with other travelers who belong to the same frequent flyer programs.

Code-sharing Agreements--Code-sharing agreements[20] appear to strengthen the position of major airlines with such agreements, especially at the airlines' hubs. One option for reducing the anticompetitive impact of code-sharing would be to remove the preference code-shared flights currently have over interline flights in CRS displays,[21] since flights that are displayed sooner are more likely to be booked. However, our survey of travel agents showed that passengers tend to prefer code-shared flights over interline flights because of customer convenience factors, such as the proximity of gates for changing planes and increased reliability in baggage handling. Thus, passengers should at least have information on whether code-shared flights are available so that they may choose the service that best meets their needs.

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[20] Code-sharing agreements are cooperative marketing agreements, generally between large airlines and smaller, commuter airlines, in which the commuter airline transports connecting passengers to and from the larger airline's flights. The passenger's ticket shows the two-letter airline code of the larger airline for all segments of the trip even though part of the trip is actually flown on the smaller airline.

[21] Interlining arrangements are the traditional method by which airlines facilitate travel for passengers who must use more than one airline to reach their destinations. Interlining agreements between airlines allow the passenger to book passage on one airline for the first part of a trip, on a second airline for the second part of a trip, and on other airlines for subsequent parts of the trip.

Conflicting Claims About Airline Pricing Practices Should Be Carefully Examined

The fourth element of the strategy is a careful examination of the claims and counterclaims about the role of airline pricing practices in the industry's financial difficulties. We urge caution before acting on the claims and counterclaims about the pricing practices of airlines. The extent of the problem and its systemwide effects need to be established and weighed against the longer-term competitive implications of any proposed action. Some industry observers believe that bankrupt airlines may be pricing below the full costs of operations. However, because the bankruptcy code is not structured on an industry-specific basis, any action to change the bankruptcy laws would likely affect firms in other industries as well as airlines. In addition, actions that would force airlines to limit time spent in reorganization could force additional airlines to simply cease operations and adversely affect the interests of airline creditors. If measures were implemented to protect the non bankrupt airlines from alleged below-cost pricing by bankrupt airlines, these measures could make it more difficult for bankrupt airlines to successfully reorganize, regain financial health, and offer effective competition. Moreover, not all discounting is initiated by bankrupt airlines. Finally, actions to limit airline pricing activity could harm consumers by reintroducing fare regulation and raising fares.

Thus, there are risks to competition from intervening in the market, even if there is a need to protect airlines from unfair pricing practices, whether the practices emanate from bankrupt airlines or from other airlines. In our opinion it is crucial to first determine whether the pricing practices of the airline industry are unique and would thus warrant different treatment before giving consideration to changing airline pricing behavior or to changing the bankruptcy laws.

CONCLUSIONS

Overall, deregulation of the domestic airline industry has benefited U.S. consumers and has made U.S. airlines more efficient competitors. Fares are lower and service is more frequent on many routes. U.S. airlines have become more efficient, and U.S. airline employees are among the world's most productive. Nevertheless, some firms in the industry face serious financial problems, and the long-term competitive health of the industry could be at risk. For its part, FAA, through more efficient allocation and use of its budgetary resources, can reduce airline operating costs and help the airlines improve their operating efficiency. In selecting solutions to the more systemic problems facing the industry, such as barriers to entry and access to capital, a well-designed, broad strategy that covers the elements we have outlined today is the best approach for improving the long-term financial status of distressed airlines and making them more effective competitors. Postponing action will dramatically narrow the range of options open to the Congress. Ensuring a competitive market will be much more difficult with fewer airlines in the marketplace.

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That concludes our testimony. We would be happy to respond to any questions you may have.

Table I.1: YEARLY AND CUMULATIVE NET INCOME/LOSSES OF MAJOR U.S. AIRLINES, 1987-92

Airline	1987	1988	1989	1990	1991	1992	1987-92 total
America West	$(45.7)	$9.4	$20.0	$(74.7)	$(213.8)	(131.8)	(436.6)
American	207.6	449.5	423.1	(76.8)	(239.9)	(935.0)	(171.6)
Continental	(258.0)	(315.5)	3.1	(1,236.4)	(305.7)	(125.3)	(2,237.8)
Delta	217.5	344.5	473.2	(154.0)	(239.5)	(564.8)	76.9
Eastern	(181.7)	(335.4)	(852.3)	(1,115.9)	b	b	(2,485.3)
Northwest	140.7	162.8	355.2	(10.4)	(3.1)	(383.0)	261.4
Pan Am	(274.6)	(118.3)	(414.7)	(638.1)	(283.1)	c	(1,728.8)
Southwest	3.8	57.4	71.4	47.1	26.9	103.6	310.2
TWA	106.2	249.7	(298.5)	(237.6)	48.2[d]	(239.8)	(371.8)
United	33.3	589.2	358.1	95.8	(331.9)	(956.8)	(212.3)
USAir	238.6	217.2	2.1	(410.7)	(305.3)	(1,230.0)	(1,488.2)
Total	$187.9	$1,310.5	$140.6	$(3,811.8)	$(1,847.2)	$(4,462.9)	$(8,482.9)

Note: Losses are in parenthesis.

[a] Totals may not add due to rounding.

[b] No data available. Eastern ceased operations in January 1991.

[c] Pan Am ceased operations in December 1991. Full-year 1991 and 1992 data are not available. 1991 data reflect January-through-September results.

[d] TWA had an operating loss of $353.5 million during 1991. Its net profit therefore, can be attributed to the sale of three of its transatlantic routes to American Airlines for $445 million.

Source: Compiled by GAO from data supplied by the Air Transport Association.

Table I.2: One-Time Charges for Compliance with Financial Accounting Standard 106

Airline	1992 net income(loss)	FAS 106
American[a]	$(935.0)	$595.0
Northwest	(383.0)	227.0
United[a]	(956.8)	540.0
USAir[a]	(1,230.0)	848.4
Total	$(3,504.8)	$2,210.4

[a] Data shown are for the holding company.

Source: Compiled by GAO from Air Transport Association data.

SELECTED INTERNATIONAL ROUTE SALES BETWEEN MAJOR U.S. AIRLINES, 1986-92

Dollars in millions

Buyer	Seller	Route	Price[a]
American[b]	Eastern	Latin American system	$471
	Trans World	3 U.S.-London routes	445
Delta	Pan Am	European routes	526
	Pan Am	New York-Mexico City	25
Northwest[c]	America West	Honolulu-Nagoya, Japan	15
	Hawaiian	Pacific routes	9
USAir[b]	TWA	2 U.S.-London routes	50
United[b]	Pan Am	Pacific routes	716
	Pan Am	U.S.-London routes	400
	Pan Am	Latin American system, Los Angeles-Mexico City	148

[a] Prices were verified with the airlines that bought the routes. In some cases, the prices include related facilities and assets as well as international route authority.

[b] Price given includes related facilities and assets.

[c] Price given does not include related facilities and assets.

PERCENTAGE OF MAJOR U.S. AIRLINES' SYSTEMWIDE REVENUE PASSENGER MILES (RPMS) REPRESENTED BY INTERNATIONAL OPERATIONS, 1987 AND 1991

Airline	International operations as percent of total operations		Percentage change in international operations
	1987	1991	(in RPMs)[a]
America West	0.0	1.9	[b]
American	12.8	21.6	139.5
Continental	16.3	27.3	73.9
Delta	9.4	15.3	145.3
Eastern	9.2	1.3	(99.3)
Northwest	35.1	42.3	60.7
Pan Am	79.8	71.5	(27.9)
Southwest	0.0	0.0	[b]
TWA	36.7	35.7	(17.9)
USAir[c]	1.7	3.5	498.2
United	15.5	30.7	142.6
Subtotal: American, United, and Delta	27.1	45.5	142.0
Subtotal: Top three airlines in 1987	58.6	41.0	(1.0)
Subtotal: Top three airlines in 1991	39.3	56.1	105.6

[a] An RPM is a revenue passenger mile, i.e., one paying passenger carried one mile.

[b] Not applicable.

[c] USAir's data reflects the airline's acquisition of Piedmont on November 5, 1987.

Source: Compiled by GAO from Department of Transportation data.

LONG-TERM DEBT AS A PERCENTAGE OF TOTAL CAPITALIZATION, 1986-90

Airline	1986	1987	1988	1989	1990	Average
Pan Am Corp.	99.0	132.3	151.1	272.9	[a]	131.1
Eastern[b]	90.7	97.3	473.3	(52.9)	(21.8)	117.3
Continental[c]	97.3	85.4	96.3	96.3	197.2	114.5
TWA[d]	94.2	89.8	101.3	114.8	140.6	108.1
America West	81.5	89.0	86.9	84.5	96.7	87.7
UAL Corp.	45.8	32.7	62.7	46.1	42.8	46.0
USAir[e]	24.8	44.5	35.6	44.8	61.8	42.2
AMR Corp.	45.1	45.0	41.0	33.5	42.8	41.5
Southwest	35.3	29.5	35.6	33.4	31.4	33.0
Delta[f]	33.4	28.7	21.0	18.3	29.8	26.2
NWA, Inc.[g]	50.8	34.4	32.1			
Industry average[h]	56.8	54.6	53.6	56.2	73.6	

Note: For years for which no data appear, data were not publicly available.

[a] Pan Am's ratio of long-term debt to total capitalization was infinity in 1990.

[b] Due to Eastern's bankruptcy, 1989 and 1990 data for Eastern are not comparable with earlier data for Eastern or with data for other airlines.

[c] Before December 31, 1986, Continental had $653.9 million in liabilities subject to Chapter 11 reorganization proceedings.

[d] TWA's data for 1986 and subsequent years reflect the airline's acquisition of Ozark on September 15, 1986.

[e] USAir's data for 1987 and subsequent years reflect the airline's acquisition of Piedmont on November 5, 1987.

[f] Delta's data for 1987 and subsequent years reflect the airline's acquisition of Western on December 18, 1986.

[g] NWA, Inc., was acquired by Wings Acquisition, Inc., on August 4, 1989. Consequently, company reports for NWA, Inc., are not available for 1989 and subsequent years. NWA's data for 1986 and subsequent years reflect the airline's acquisition of Republic on August 12, 1986.

[h] Industry average data include data for Ozark, People Express, Piedmont, Republic, and Western until their respective mergers.

Source: Julius Maldutis, *The Financial Condition of the U.S. Airline Industry at Year-End 1990*, Salomon Brothers (New York: June 1991), p.8, fig. 10. Data are drawn from company reports.

RELATED GAO PRODUCTS

Air Traffic Control: Advanced Automation System Problems Need To Be Addressed (GAO/T-RCED-93-15, Mar. 10, 1993).

New Chicago-Area Airport: Site Comparison, Selection Process, and Federal Funding (GAO/RCED-93-105, Feb. 22, 1993).

Airline Competition: Strategies for Addressing Financial and Competitive Problems in the Airline Industry (GAO/T-RCED-93-11, Feb. 18, 1993).

Air Traffic Control: Justifications for Capital Investments Need Strengthening (GAO/RCED-93-55, Jan. 14, 1993).

Transportation Issues (GAO Transition Series) (GAO/OCG-93-14TR, Dec. 1992).

Airline Competition: Impact of Changing Foreign Investment and Control Limits on U.S. Airlines (GAO/RCED-93-7, Dec. 9, 1992).

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Air Traffic Control: Advanced Automation System Still Vulnerable to Cost and Schedule Problems (GAO/RCED-92-264, Sept. 18, 1992).

New Denver Airport Followup (GAO/RCED-92-285R, Sept. 14, 1992).

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FAA Budget: Key Issues Need to Be Addressed (GAO/T-RCED-92-51, Apr. 6, 1992).

Air Traffic Control: Status of FAA's Modernization Program (GAO/RC[illegible]2-136BR, Apr. 3, 1992).

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Aviation Safety: Better Oversight Would Reduce the Risk of Air Taxi Accidents (GAO/T-RCED-92-27, Feb. 25, 1992).

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Aviation Safety: Air Taxis--The Most Accident-Prone Airlines--Need Better Oversight (GAO/RCED-92-60, Jan. 21, 1992).

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Aviation Safety: Problems Persist in FAA's Inspection Program (GAO/RCED-92-14, Nov. 20, 1991).

Aviation Safety: Emergency Revocation Orders of Air Carrier Certificates (GAO/RCED-92-10, Oct. 17, 1991).

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Air Traffic Control: FAA Can Better Forecast and Prevent Equipment Failures (GAO/RCED-91-179, Aug. 2, 1991).

Aviation Noise: Costs of Phasing Out Noisy Aircraft (GAO/RCED-91-128, July 2, 1991).

FAA Information Resources: Agency Needs to Correct Widespread Deficiencies (GAO/IMTEC-91-43, June 18, 1991).

Aircraft Maintenance: Additional FAA Oversight Needed of Aging Aircraft Repairs (Volumes I and II) (GAO/RCED-91-91A and B, May 24, 1991).

Airline Competition: Effects of Airline Market Concentration and Barriers to Entry on Airfares (GAO/RCED-91-101, Apr. 26, 1991).

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FAA Staffing: New Pay Act Offers Options to Bolster Maintenance Work Force (GAO/RCED-91-92, Apr. 2, 1991).

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Airline Competition: Industry Operating and Marketing Practices Limit Market Entry (GAO/RCED-90-147, Aug. 29, 1990).

Air Traffic Control: Continuing Delays Anticipated for the Advanced Automation System (GAO/IMTEC-90-63, July 18, 1990).

Airline Competition: Higher Fares and Reduced Competition at Concentrated Airports (GAO/RCED-90-102, July 11, 1990).

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Competition in the Airline Computerized Reservation System Industry (GAO/T-RCED-88-62, Sep. 14, 1988).

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Mr. CARR. Mr. Mead, I got in here extra early this morning and I read your full statement. I am a fan of yours and the work that you do. I find that every time I read what you prepare I learn something. I want to let you and your colleague know that the work you do for this Committee and for the Congress in general is deeply appreciated.

Frank, do you have anything to add?

Mr. MULVEY. No, not at this time Mr. Chairman.

STATEMENT OF CLIFFORD WINSTON

Mr. CARR. Next we will hear from Dr. Clifford Winston, senior fellow in economic studies at the Brookings Institution.

Mr. WINSTON. We have a joint presentation.

Mr. CARR. Then we will hear from you and Dr. Morrison as a duet.

Mr. WINSTON. Thank you, Mr. Chairman.

We were graduate students together at Berkeley and we have been working on research of the airline industry for the better part of a decade now. We're going to give to you a presentation that is largely shaped by research we have done on deregulation, but also on new research we are doing for a book on the evolution of the airline industry.

It will touch on some of the responsibilities of this Committee, but it will probably also go beyond into the work of the commission.

We are going to focus our presentation on public policies that we think are worth consideration during the troubled times this industry is experiencing, but probably equally important policies that shouldn't be considered in our view.

Any assessment of the airline industry must first really establish what deregulation has accomplished. That will be the focus of my opening remarks and then Steve will turn more constructively to the policies that are worthy of consideration.

My statement on deregulation is based on the paper that we gave to you, so that is where the information on that is contained.

Let me begin by suggesting a framework on how to think about the problem because obviously deregulation and its effects have been quite controversial and whether people have done research on it or not, they have strong views. The way we tend to look at it is to compare an actual environment in terms of what has happened in fares and service and so on with what would have happened with an alternative regulatory environment. That sort of identifies the fundamental problem in thinking about this.

Deregulation and regulation never occurred at the same time. So you have to look at an actual environment and then compare everything else held constant with what that alternative environment would have looked like. We are basically looking at "It's a Wonderful Life" as compared with the airline industry. In that film, one got to see in real time what the world would have looked like had the person never been alive with what the world looked like when the person was actually alive.

Things may look bad in real time, but they could look a lot worse in an alternative environment. This will not preview an excuse about the performance of deregulation but it is something to keep in mind.

So what we looked at were the effects on consumers and airlines and tried to identify all the effects. You have to be careful in recognizing what deregulation is responsible for. I think the heart of what we have is contained in figure 2, which is a critical graph. That is showing that there has been a significant increase at the route level in airline competition since deregulation. Although there has been a reduction in carriers at the national level, at the route level, where competition actually occurs, there has been an increase.

And that leads to the key result on what the fare effects have been in figure 4, which uses "what would have been with what actually was" type of analysis to show that during the 1980s into the early 1990s for every year regulated fares have been above that of deregulated fares. That amounts to an estimated savings of 20 percent on average and an annual benefit of $8 billion in 1990 dollars.

We hasten to add that not everybody has gained from deregulation. There has been an increased variance in the fares, and that is shown in figure 5. We have calculated that roughly 69 percent of the travellers pay lower fares than they would have been paying under regulation. Although on average there have been benefits, certainly when people do complain about what has happened some of them are justified.

Turning quickly to service, there has been a significant improvement in service frequency through hub and spoke, especially for the business travellers. I don't have a graph on that. That was a calculation we did. The order of magnitude of the benefits are similar to the fare benefits, about $9 billion in 1991 dollars. So on average you have fare gains from deregulation, on average big frequency gains, particularly for business travellers.

But they have been offset. There have been losses. There has been an increase in travel time, arguably, as a result of deregulation. That is put in our figure 10.

Also something that has been overlooked—although certainly not by the people who experience this—a cost from the restrictions that come about from getting certain fares. That is, one may get a discount fare, but have to spend a Saturday night. For pleasure travellers, that is probably not a binding constraint. They are planning on doing that anyway. But for a business traveller who wants to take a discount fare, he has to stay a Saturday night to qualify for that fare. The cost of spending that Saturday night is something that is real and that has to be included. You will be overstating the benefits from fare deregulation unless you do that.

We have done that calculation and find that really the fare benefits ought to be cut back by about $3 billion, largely to the business travellers.

So overall, though we find significant benefits to consumers from fares and the service frequency, there have been costs of the sort that we just mentioned. In addition, safety continues to improve. So overall, I think it is pretty clear that the consumer has been better off.

Let me quickly turn to carriers. Carriers' profits in actual terms are certainly substantial losses, but when we did this kind of analysis—what is and what would have been. We found that at least up to 1988, perhaps surprisingly, that although carriers have been losing a bit of money, they would have lost even more had they been subject to regulation. That may surprise you, but intuitively what is going on is that regulation limited the kinds of responses that carriers could make to changing economic conditions. Deregulation at least gave them the opportunity to make responses that we have found actually has made them better off.

If deregulation has been so great, what has gone wrong? As was touched on previously, there has been over expansion, too much capacity. But this is not a new problem. This problem existed during regulation and will probably always be a problem. It's a cyclical industry. You want to plan for growing demand, but you have to plan far in advance in buying aircraft. So that makes things difficult for forecasting. That has always been a problem.

But under deregulation, arguably you have a very new experience. This is really the first decade that the carriers had to experience going through a business cycle on their own, and particularly going through an expansion on their own between 1983 and 1988. This apparently caused some difficult problems, but we don't believe these are chronic problems.

What happened is that between 1985 and 1990 the airlines basically doubled their fleet capacity. They doubled the amount of aircraft in that industry. Now, some of that aircraft is parked out in the desert, but they did buy an awful lot of planes during that period, nearly doubling what had been available in the industry for the previous 15 years.

So what happened is that some carriers were actually earning negative returns in the late 1980s before the major national economic problems occurred just in terms of adjusting to this expansion. It started slowing down and they were caught with all this capacity.

Individual carriers also made some mistakes in terms of getting too much debt and too rapid an expansion. We won't be too specific about who these carriers were. They know who they are.

Then once you have this, layered on top of all that an industry-wide problem of over-expansion, some individual problems, and then you bring in the war-related travel declines and the recession and that layering has caused some serious problems.

What do we draw from all this in terms of the deregulated environment? It is probably the case, in terms of an analyst's perspective, that carriers probably didn't adjust as well to the deregulated environment in terms of a business cycle as well as we thought they might. Nonetheless, I think it is critical to keep in mind—and this is probably the heart of my testimony—deregulation itself was not managed as efficiently as possible. I think that really is the heart of our policy guidelines. What one wants to really do is improve the efficiency of deregulated markets. Our strong recommendation as policy is not to pursue or not to reregulate.

Steve will now go into the details of what policies we think you should pursue. Those will include approaches on taxes, the appropriate ticket tax, and the fuel tax, and then something that is obviously important to this committee, treatment of airports. There we are talking about airport pricing and investment and particularly efficiency.

In a broader perspective, infrastructure has received a lot of attention now with the Clinton Administration. A major theme of our research has been to make more efficient use of the infrastructure we have by pricing it correctly and building it correctly before making massive investments. That can save us a lot of money. I think it was a positive thing to actually see the budget proposals for infrastructure spending not particularly high because I think we could spend more time on more efficient uses of what we have.

The third issue is bankruptcy laws where Steve will present some new evidence on the effects of bankrupt carriers to the industry. And then finally international deregulation and our feelings about how that ought to be pursued. One learned that domestic deregulation allowed the domestic carriers to improve the efficiency of their domestic networks. We believe that international deregulation, if handled properly, can do the same thing.

The final thing we would draw from this is just basically the knowledge and learning from past adjustment difficulties. It is hard to make a policy from that other than the suggestion that really the airline commission could serve an important education function both for the industry in getting an understanding of the difficulties in the past and hopefully not repeating them, and also the public so that they really have an understanding of what has transpired and why it has transpired.

Steve will now turn to a more specific discussion of the policies.

STATEMENT OF STEVEN MORRISON

Mr. MORRISON. The industry is in turmoil. There is no question about that. Some would say crisis. But as Cliff indicated, we believe that this is not a time for drastic measures.

Cliff has outlined some figures that say that deregulation has served travellers and indeed carriers well. As he said, what I am going to do is go through some proposals and some analyses that we have done of some proposals or tentative proposals to see what their effect may be.

The first thing I would like to talk about—which both Mr. Mead and Cliff mentioned—is this business about overcapacity, which we believe is the primary source of the industry's current financial problems. This overcapacity is usually summarized as too many seats chasing too few passengers.

Overcapacity is not new to deregulation, but stems from the nature of the business, as Cliff pointed out. I would like to go through a little bit of an example.

The nature of the business is that it is a business where demand is very sensitive to changes in personal income. A 1 percent change in income leads to about a 2 percent change in demand. Also, airlines are an industry where capital assets—that is, their aircraft—are long-lived and must be ordered years in advance.

Both of these mean that airlines must forecast GDP and thus their demand for years into the future. If the forecasted growth fails to materialize, overcapacity results. The other side is that if growth is bigger than anticipated, undercapacity results.

For example, if real GDP per capita had grown from 1989 to 1992 at the same 2 percent annual rate that it had during the previous 30 years, GDP per capita in 1992 would have been 7 percent higher than it was; airline demand, therefore, would have been 14 percent higher than it was.

If GDP per capita had continued growing at the nearly 3 percent rate it had during the 1980 to 1989 expansion, airline demand in 1992 would have been 18 percent higher than it was. Carriers make projections based on forecast of GDP, therefore it is not surprising that they would come up with too many aircraft when recession hits. In that sense, as others have said, the best solution to this problem is a healthy economy.

I will add parenthetically that to some extent this has been exacerbated by deregulation, but in a sense in a positive way. Deregulation has brought more pleasure travellers into the marketplace. Pleasure travellers are more income sensitive than business travellers. So this income sensitivity has arguably increased under deregulation.

When anyone talks about overcapacity, the issue of the bankrupt carriers comes out. We have recently completed some research that addresses this issue. Several airline CEOs have pointed to the presence of carriers under chapter 11 as a source of the industry's financial difficulties and have advocated changing either bankruptcy laws or certification requirements to reduce the time a carrier can spend in chapter 11.

This problem is in a sense new to deregulation for two reasons. First, under regulation, carriers did not have pricing freedom. Second, the CAB arranged mergers of convenience to avoid a carrier going into bankruptcy.

At any rate, to assess the effect that competing against bankrupt carriers has on healthy carriers, we performed a statistical analysis of fares on the top 1,000 domestic routes. For this analysis, we looked at American, Delta, Northwest, United, and USAir from 1978 to 1991 and controlled for the normal things one would expect fares to depend on—distance being the most important one, the extent of competition on the route, the number of carriers, and the extent of competition at the two airports involved to capture the airport effect that Mr. Mead has alluded to.

But we also tried to take into account the presence of particular carriers in bankruptcy, in particular, Continental, Eastern, Pan Am, America West, and Midway. We are in the process of updating our data through 1992 so that we can include TWA.

Our results tentatively indicate that the consequences of competing against a bankrupt carrier are idiosyncratic. That is, it depends on which healthy carrier and which bankrupt carriers are involved.

Examining 1989 to 1991, we found that indeed some carriers have been adversely affected by competing against bankrupt carriers. However, we also found that some carriers have benefitted. In those cases, the bankrupt carrier does not provide effective competition and the healthy carrier can charge a fare premium. On balance, however, the effect on profitability of healthy carriers as a group was a wash.

This leads us to conclude that the presence of bankrupt carriers is not an important source of the industry's financial problems, but certainly is a source for some particular carriers' financial problems. This is an area that may warrant policy changes and certainly further investigation by us and others is warranted.

Something perhaps more germane to the Appropriations Committee which has a bearing on airlines—and I would like to speak on this for a minute—is high-speed rail.

Studies that I am aware of indicate that in order for high-speed rail to be viable it will require a subsidy. The justification for the subsidy is generally said to be the positive impact. The beneficial impact, that high-speed rail would have on airport and highway congestion and on pollution, of course, to the extent that there is a beneficial impact that comes by diverting passengers from airlines, which certainly does not help airlines' financial condition.

However, I believe it is questionable whether the magnitude of these congestion and pollution benefits are sufficient to justify a subsidy. That is certainly something that a cost/benefit analysis could confirm or refute.

More importantly, however, there are better ways than rail subsidies to reduce congestion and pollution. These are things that Cliff mentioned. In the airline context, this means peak hour landing and take-off fees. These fees recognize that runway space during peak hours is a scarce commodity and uses the pricing mechanism to ration it.

This may or may not be of direct financial help to the airline industry, but it certainly would be conserving of Federal Government resources so as not to build new runways or expand capacity where that capacity could be better managed through the pricing system.

Another related policy not directly targeted at the airline industry, but one that certainly affects it is the issue of energy taxes. This is related to the issue of pollution that I mentioned, which is related to the arguments of subsidy for high-speed rail.

Clearly, energy taxes of any kind would adversely affect the airline industry because of the amount of fuel they use—a 1 cent tax adds more than $100 million to their cost. However, if the tax were based on the cost of environmental damage done by burning jet fuel, the harm to the industry and travellers would be more than offset by the gain in improvements in environmental quality.

However, my understanding of the proposed energy tax is based on BTUs in a barrel of oil and not on any estimate of environmental damage. Thus, in my view, the proposal represents a missed opportunity. The proposed tax will hurt the industry with fewer benefits for the environment than the tax is designed for, which is to control the negative consequences of burning fossil fuel in general, and jet fuel in particular.

I would like to mention quickly the issue of foreign investment. The issue of foreign investment is a controversial one. Certainly an influx of foreign or any other capital into the industry would increase the chances of survival of financially weak carriers. But the industry's problems are not a lack of capital, but too much capacity, which foreign investment would only exacerbate.

However, also as Cliff pointed out, foreign investment would yield benefits by developing integrated international route systems that would provide seamless service to travellers. Thus, while foreign investment is not a solution to the industry's financial plight, foreign investment in United States airlines is beneficial to travellers and should be studied in that sense rather than as a solution to an industry-wide problem. It is a solution to a traveller problem, I believe.

In brief summary, the best policy for the airline industry and everybody else is a healthy economy.

Mr. **Carr**. Thank you very much. It is obvious that you have taken a lot of care in the work that you do. I find your graphs particularly interesting and look forward to studying them with more time.

Mr. Wolf, do you have a statement you wish to make?

Mr. **Wolf**. No, Mr. Chairman.

IMPACT OF F&E FUNDING ON AIRLINES

Mr. **Carr**. Then I would like to ask a few questions. We have plenty of time for that. I will begin with you, Mr. Mead.

Your statement indicates that better use and management of FAA's Facilities and Equipment funds could better assist the airlines in reaching long-term profitability. It does appear that some of the largest F&E programs offer little to the airlines, such as the advanced automation system and the microwave landing system. Could you go into a little more detail on how we might adjust F&E priorities to provide more support for air travel in general and the airlines in particular?

We get these requests. In a few weeks, we're going to have the FAA hearing on their budget request. I am not sure that they provide us with any criteria or detail as to why they are spending resources in what area. According to your testimony, they seem to lack criteria.

What could we do to encourage them along a better route?

Mr. **Mead**. I think substantively the F&E account is quite different in how you would approach this as a Committee than the AIP account. With AIP, people outside of FAA come in and at least say that they need something. That is a good start. F&E is not necessarily that way. Projects can percolate up within FAA.

There has been a requirement for years, Mr. Chairman, that when FAA starts one of these projects, before they come up here and ask you for money, that they do what is called a mission needs analysis which not only is supposed to take into account the needs of FAA but the industry's needs, the benefits that might accrue to the industry, whether there are alternative ways of achieving a particular end, and what costs a system might impose on the industry.

You know, a lot of the systems that are underway now got underway without having a mission needs analysis. They just got underway. I think in some way the sins of the fathers are being visited on the sons.

Let me give you a couple of examples. Take the microwave landing systems. This is a program that FAA has been proposing for years. There is not an enormous amount of industry support for this program as a universal replacement for instrument landing systems.

If you go forward with MLS, though, it is going to impose costs on the industry. They will have to put special avionics packages in their planes. These things can be quite expensive. Whereas the industry now feels that there are alternative avionics packages—that maybe the current ILS system with some enhancements could be a bridge to satellites—and they wouldn't have to make this investment.

Take AAS, the advanced automation system that you mentioned, as a second example. The bulk of its benefits were expended to result for more fuel efficient routes. I am not sure on what basis the AAS is going to offer fuel efficient routes. That is quite a statement 10 years into the program.

But now all the discussion has to do with the AAS, which is essentially the replacement of the consoles that the controllers have. They need to have those replaced, the last stage contemplates fuel efficient routes for the airlines, but that is some years away.

[Additional information from GAO follows:]

Before the Congress is asked to make funding decisions on capital investments, FAA needs to follow a more disciplined process. First, as noted in our recent report to your Subcommittee on FAA's justifications for capital investments (GAO/RCED-93-55, Jan. 14, 1993), FAA needs to do a better job measuring the shortfalls in its current systems. This would include where airlines pay a penalty for inefficiencies in the airspace system. Second, FAA must analyze the costs, benefits, and risks of alternative approaches for addressing these shortfalls. As we pointed out in our report to your Subcommittee on precision landing systems (GAO/RCED-93-33, Nov. 13, 1992), such analyses must consider the full range of alternatives for meeting system needs. Third, when the needs are defined and the alternatives weighed, then the agency would be in a better position to set priorities. FAA could then propose F&E projects to the Congress that are based on a sound foundation of analysis, including an assessment of how to best meet the needs of users such as airlines.

WEATHER-RELATED ATC EQUIPMENT

Mr. **Carr**. One of the things that comes back to this Committee time and again is the fact that about two-thirds of air traffic control delays apparently are caused by weather or some weather-related phenomenon. I would like you to focus on the fact that FAA and the National Weather Service, under NOAA, have joint responsibility for the development and procurement of weather-related ATC equipment.

We know that the FAA has problems in the procurement area. And as a result of being the Vice Chairman of the Committee that oversees the spending of NOAA, we know that the Weather Service has an even greater problem.

I am wondering whether the split responsibility between the Weather Service and FAA is causing a problem in implementing weather-related technologies that could reduce delays. Should we, as a Congress, be trying to consolidate that?

Mr. **Mead**. I will get back to you on that one.

Mr. **Carr**. According to the FAA, air traffic control delays cost the airlines and their customers over $3 billion each year. About two-thirds of that delay is caused by weather. What technologies should we be pursuing or accelerating to most effectively address this problem?

[The information follows:]

FAA is pursuing several technologies, including parallel and converging runway monitors and the converging runway display aid (CRDA), that will allow greater acceptance rates at airports with closely spaced or intersecting runways. According to Mitre officials, the use of CRDA at St. Louis Lambert Airport contributed to about a 50 percent decrease in delays in bad weather conditions during inclement weather. We have not compared the various technologies that could be used to reduce weather-related air traffic delays to determined which should be pursued or accelerated.

SLOT-CONTROLLED AIRPORTS

Mr. CARR. It also occurs to me, by way of the record, that the Weather Service gets to tap into the aviation trust fund for this money. It would seem to me that this program ought to be consolidated within one agency and perhaps within the Congress. That might be a little help.

In your statement before the Public Works Committee a few weeks ago you said that technical improvements in air traffic control may make it feasible for the FAA to increase the number of slots available at slot-controlled airports.

What technology were you referring to, and is it fully developed and ready for development at major, high density airports?

Mr. MEAD. What I meant by technical improvements were things like flow control and other things of that nature. It has been many years, Mr. Chairman, since FAA decided on how many slots there would be for these airports. The playing field has changed substantially since then, both in air traffic control procedures, certain computer processes they put in place. They have evaluated O'Hare, for example, time and time again and it is just frankly time to reconsider the slot allocations, how many slots there are, and who should get them.

Mr. MULVEY. If I could add to that, along with what Steve was saying before about the pricing of our airport capacity—we might be able to handle more planes. As you know, that was tried in Boston, but that experiment had other problems.

[Additional information from GAO follows:]

Runaway acceptance rates at high density rule airports could be enhanced in the future through the use of FAA's Terminal Air Traffic Control Automation (TATCA) projects. Initially designed by the National Aeronautics and Space Administration (NASA), TATCA is expected to provide controllers with a capability for more efficient sequencing and spacing of aircraft. The CRDA element of TATCA is being implemented at St. Louis and has been installed on computers at other air traffic control facilities. Other TATCA elements are expected to be ready for implementation in the mid-1990s. Further, it would make sense for FAA to periodically identify all technological and procedural options to improve the management of airspace and traffic flows at high density rule airports.

Mr. CARR. Have you looked at the slot problem in your research? It seems like it is a vestige of regulation that is hanging on and particularly at O'Hare. I think there are a lot of political reasons for local communities near Chicago to keep their commuter service in there.

The suballocations of slots between the regional carriers, the commuter carriers, and the major airlines is always a vexing problem. We get constant complaints about it here. Did you look at that at all?

Mr. WINSTON. Our perspective on slots is probably two-fold. One is identifying the effect of slots on fares. I think we have consistently found that the presence of slots does have an elevation or an anticompetitive effect on fares. There is that element to all this in the service quality.

The thrust of what we have done, though, is actually implement, in an empirical sense, a congestion pricing system of this sort we discussed. You have what we call marginal costs, take-off and landing fees based on the cost in terms of the time that carriers impose on each other, and analyze what the effects would be compared with what the current weight-based system has produced.

I am not 100 percent sure of this, but my guess would be that if we put in a congestion pricing system I don't think we would need slots.

Mr. MORRISON. I agree. When Cliff said the current weight-based system, he was referring to w-e-i-g-h-t based landing fees. But we also have a w-a-i-t based system as well in terms of—since landing fees are so low at airports in general, congestion is a means of rationing.

We have argued in the past that slots are better than no slots and congestion pricing is better than slots.

Mr. WINSTON. Then politically you would see what the distributional effects are. These are weight-based, so general aviation and commuters would pay considerably more compared to what they are paying now than what the commercial planes would pay.

Mr. MULVEY. Our research also finds that slots are a factor in fares. The people flying into slot-controlled airports pay somewhat higher fares just because the airport is slot-controlled.

AIRLINE PRICING

Mr. CARR. One of the things that occurs to me in all the research that I have read on pricing is that a lot of the pricing studies have to do with segments rather than studying the fact that airlines compete between cities. I think there is a natural tendency to try to focus on the segment because that is one of the things that the consumer focuses on because they are looking at their own ticket.

We had a press conference the other day announcing our support for the passage of the law that would establish the commission. I recall one of the participants questioning openly why it costs more to fly between two closer cities than two further cities. I think that somewhat misses the point on airline pricing, doesn't it?

Even in your own studies I have read it seems to me that you have been focusing on segments and not city pairs.

Mr. MEAD. We have focused heavily on concentrated airports, airports that are dominated by one or two airlines. Our work does find some interesting phenomena. It does seem that airports that are dominated by one or two airlines, at which there are usually a number of entry barriers fares tend to be higher. Even though there may be two or three airlines competing on particular routes out of that airport, the sheer dominance of one or two airlines seems to have some elevating effect on fares.

Do you want to add to that?

Mr. MULVEY. We are in the process of updating our work on fares at concentrated airports and we hope to release that study this spring. Our earlier work found fares around 20 percent higher at concentrated airports just from one or two carriers dominating those airports, after correcting for distance and other factors.

Mr. MORRISON. I should point out that we have an ongoing—hopefully to be resolved soon—controversy between Cliff and my work and the GAO's work. We have analyzed hub premia at the 15 concentrated airports identified by the GAO, and we found that the premium is on the order of 5 to 10 percent, not the 20 percent that they found. This is a methodological issue that we're going to try to resolve. Either they will admit that we are right or we will admit that they are right.

But I think this is not a settled issue in terms of how big the fare—we will admit that certainly they exist, but it is a question of whether it is 5 percent or 20 percent or something higher.

You mentioned the fares for some trips. Of course, that is true in individual cases, but I could have paid $600 to come here and for that same fare I could have gone to London for a couple of weeks. But we are comparing apples and oranges when you look at a restricted, deeply discounted ticket with Saturday night stays and advance purchase with on-demand walk-up get-a-seat-at-the-last-minute fares.

Certainly, average fares decline with distance. Individual tickets may vary, but if you look at average fares by distance, they go up consistently.

Concerning your distinction between segments and city pairs, our analysis of fares uses the databank 1A ticket sample, which is the only non-proprietary source that we have access to. That is a ticket sample so we can look—we look at OD pairs, which is where the consumers are going from and to, focusing mainly on direct flights because that way you can link the fare paid to the trip taken. If you have a flight that goes A, B, and C—you don't know whether they stopped in B and spent the weekend and went on to C or whether indeed that was just the connecting flight.

We have studied that and found—again, we can quibble with numbers, but concentration affects fares, airport concentration affects fares, slots affect fares.

Mr. CARR. I think it is something that at least this Member of Congress has taken an interest in to the extent that we have had some off-the-record briefings by airline representatives about pricing—I am suggesting it is a lot more complex than the average consumer and the average travel reporter for your local newspaper would be led to believe.

The point is that airlines compete between cities and not on segments. I serve an area where there is a dominant carrier at a dominant airport and everybody feels victimized and trapped. Then we get these studies that show that fares are elevated at hubs.

I suppose that's an illusory benefit to a lot of people who only take an airplane once every 2 years, but the fact of the matter is that people at a hub could be said to be getting something for it in that they have multiple destinations that they would never, never have.

How that gets parlayed between the business traveller who goes by schedule and the leisure traveller who goes by price and whether all that is fair is a question.

What does this all have to do with the Appropriations Committee? I guess that is where I want to focus. It is a competitive situation. Now when we are asked to appropriate money for an airport improvement program, for example, to an FAA that does not lay down its priorities based on some kind of an economic rate of return as opposed to just doling out the money. We know that every additional cost that the airlines have to bear—whether it is a passenger facility charge or a ticket tax—they are eating it today. The airlines are paying the PFCs, not the passengers.

The ticket tax is being paid by the airlines and not the passengers. They are losing money. Pricing is important here because the airlines don't just tack it onto the ticket and pass it on. It just doesn't happen that way. We have to be more sensitive to that.

Now, when we get to the airport improvement program, shouldn't we be asking the FAA to prioritize their requests?

And let me venture into an area that this Committee has typically stayed away from, but maybe we ought to rethink the question of earmarking airports.

Mr. MEAD. That's a difficult question, but let me take a stab at it.

There are two parts to your question, as I understand it. About 60 to 65 percent of the AIP program goes out under formula right now. There is another 20 to 25 percent that goes out under various set-aside programs that have cropped up over the years. So when it is all said and done, you don't have a substantial amount that is totally discretionary.

But FAA can and should be setting some priorities. I think the Committee ought to insist on it. It is very important from two points of view. Airlines end up paying for a lot of these airport improvement projects. FAA doesn't pay for all of it. Even though the law says that the match is about 75 percent, it is rarely 75 percent. It is much less. The airports will come and ask the airlines to contribute.

Secondly, I know everybody would like to fund the AIP program with more dollars, but this is a time of tight budgetary constraints. I think there are some expenditures out of the AIP that one will have to wonder about. Frankly, the new Denver Airport is a fairly costly undertaking. It is going to be—the airlines there know that the enplanement fees are going to be very high—possibly the highest in the United States. So they are interested in maximizing revenue from the airlines.

Just this past year, there was a proposal that got quite far along to fund a facility with millions of dollars within 7 or 8 miles of the new Denver airport where you have already committed $500 million. So that is important.

On the earmarking, I do think that the Congress and the FAA are going to have to give a bit. FAA needs to develop some credible criteria for the program, and Congress—if it wishes to actually apply that criteria—is probably going to have to take a look at relaxing some of these formulas and earmarking schemes and so forth that have been developed.

And in fairness to the Congress, I think these earmarking schemes and the formulas have come up over the years to fill a void over at FAA because Congress doesn't know what FAA's priorities really are or where they are headed.

DIVERSION OF AIRPORT FUNDS

Mr. Carr. Another area that we began looking into a couple of years ago—and on which we have just received testimony yesterday from the Inspector General—is the area of diversion. The Inspector General found that in 22 airports they surveyed over the last year, about—and this is subject to check of the record—two-thirds to three-fourths of the airports they looked at were diverting money away from aviation use toward general municipal use. Of course, all of that ends up getting paid for again by the airlines.

We even have the example, apparently, right now in the city of Los Angeles where they have passed a referendum and there seems to be some political competition in Los Angeles to see who can divert money from LAX to general municipal services in Los Angeles County or city.

To what extent is the FAA being vigorous in enforcing the rules against diversion of airport funds?

Mr. Mead. As you know, we have a body of work that we had started recently on the AIP program for you. I can't give you a complete answer to that question today.

I can say that this issue of airport money—whether it should stay on the airport grounds, per se—is becoming a very complex one in several large communities in this country. The ISTEA legislation encourages mass transit and highways and rail to a certain extent, to begin to think of transportation as a system—it is something fairly new in this country. Usually we look at each system separately.

I was in an airport recently, Mr. Chairman, where the airport authorities told me that the problem they face is that the airlines look at the airport as a place where airplanes pick up passengers and drop off passengers. That becomes the airport's problem because they have to do something with those passengers. So you get into questions about access roads and who should pay for them.

It is not an area that is going to be easy to address. It is an area that is going to evolve over the next 5 years.

Mr. Carr. I have had those same conversations and I might indicate to you that I am really troubled by some of what I hear. Airport managers and airport authorities have a tendency to want to use aviation funds for surface transportation uses I think because they perceive it to be the easier course. It is easier for them because they seem to own a piece of the stream of that funding than it is to go to the State DOT and beg for the favor of the State director of transportation to build them a highway from their airport to the city they serve.

Mr. Mead. That is very true.

Mr. Carr. So a lot of it has to do not with the airport management's desire, as much as it has to do with the path of least political resistance, because they have a pipeline directly to the FAA. They don't have a direct pipeline to FHWA or FTA.

Mr. Mead. That's true.

Mr. CARR. It seems to me that some of that ought to get resolved. Otherwise there is going to be more money diverted to surface transportation. Again, because it has the stamp of aviation on it, the airlines are going to pay for it. Maybe when we get to a point where the aviation industry has recovered and they are making profits, then we can say that the consumer is paying for it. But right now, the consumer is not paying for it, the airlines are paying for it.

Mr. MEAD. That is very true. I have an anecdote from a major metropolitan area in this country. Under the ISTEA legislation, they were directed to come up with integrated, intermodal plans for dealing with the transportation problems in their area. A question arose as to whether that included the airport.

The airport in this metropolitan community is the major transportation center. But the metropolitan area was looking to the airport as the airport taking care of their problems. The airport was saying that they couldn't get any money from the State DOT. I think the phenomenon you're describing is quite a good one. The new Administration is certainly going to face this challenge.

Mr. CARR. I hope the commission would look into this. Again, it is not one of the major problems of the airline industries, but it certainly bears on it that at some point we have to decide what is surface and what is air. You do have to have some integrity in the boundary of that. We can sympathize with our airport management.

In Detroit, Michigan, we face the same problem. What we did there was that we made sure that the major access road to the airport was from highway funds. Yet I go to airports all over the country and I get briefed by airport managers and they are quite proud of the parking structure they are building or the light rail system they have into town or the highway. They are looking for a contribution from the air side.

Either we have an aviation trust fund and a highway trust fund and we know the difference between the two, or we ought to just have one big trust fund and then everybody goes after it. It seems to me that we're in a very dangerous position.

JOBS LOST IN AIRLINE INDUSTRY

Mr. CARR. Mr. Wolf, do you have any questions?

Mr. WOLF. Thank you, Mr. Chairman.

I have a number of questions. I will submit some for the record, but maybe some can be answered with a sentence or two. Mr. Mead, I may have some questions on the Denver Airport that might take a little longer.

How many jobs have been lost in the airline industry in the last 3 years?

Mr. MULVEY. I don't think we have the precise numbers, but we can look at what has happened with regard to lay-offs of individual carriers. I don't have a total with me.

Mr. WOLF. I think that is important, though, because that seems to tell us where we are and what has happened.

Do you roughly have a sense?

Mr. WINSTON. I would say 50,000 to 100,000.

Mr. **Wolf**. Submit that for the record.

Mr. **Mead**. I think it is 500,000 total employment.

Mr. **Wolf**. What is the multiplier of jobs lost outside for industries such as tourism? That is really important because if you lose airline jobs, then people lose jobs in motels, hotels, travel agencies, et cetera.

Mr. **Mulvey**. We do not have that with us. Those are calculated and we could provide those for the record. Often, it could be 2 to 1, but it varies.

Mr. **Wolf**. One airline told me 3 to 1. Do you have any comments on it?

Mr. **Mulvey**. It could vary by location.

Mr. **Wolf**. For every job lost in the airline industry, what does that do to the travel agency, to the person writing the ticket, to the baggage carrier, to the taxi cab, to the motel, to the restaurant—could you provide that for the record?

Mr. **Mead**. Sure.

[The GAO response follows:]

Reduced income and employment in any one sector of the economy will have repercussions on other sectors—the magnitude of the impact depending on the interstitial relationships among affected industries. The impact is called the "multiplier effect" and is often employed to gauge the total benefit from a new investment. Obviously such affects go both ways and downturns in one sector have effects on related industries. The Bureau of Economic Analysis in the Department of Commerce calculates input-output tables for the nation's economic activity. The Bureau of Labor Statistics updates these tables and calculates industry specific employment multipliers. According to a BLS analyst, the multiplier for airline employment is 1.02—that is, for every job gained or lost in the airline industry just over 1 additional job is lost in other industries related to the airline industry.

Industry claims that 2 or 3 jobs are lost in other travel-related industries for each job lost in the airline industry are not necessarily wrong, however. The multiplier relates to the loss of other jobs directly as a result of the lost job in the airline industry. The loss of jobs in the travel industry might be coincidental to the lost airline jobs. Each was caused by the same set of factors (weak economy, etc.), but only one of the 2 or 3 other jobs lost can be traced directly to the reduced airline employee.

EFFECT OF BTU TAX ON INDUSTRY

Mr. **Wolf**. What effect will the BTU tax have on the airline industry?

Mr. **Morrison**. Well, 1 cent equals $100 million plus in extra costs, so take whatever estimate—7 cents, 10 cents—and multiply it.

Mr. **Wolf**. They lost last year $4 billion, so this would be a big hit to an industry that is having problems right now.

Mr. **Mead**. I should say that of the losses last year, about $2 billion of what has been reported so far is due to an accounting change for retiree benefits.

Mr. **Wolf**. So that would even make the impact of the BTU tax higher, then.

Mr. **Mead**. Yes, it will, proportionately.

Mr. **Wolf**. And that doesn't make it better. That even makes it worse.

Mr. **Mead**. The way this industry works, they will try to pass it on, but they may be unsuccessful.

Mr. **Wolf**. I wonder if the Clinton Administration has focused on all that. They have talked about the airline industry. He's going after Boeing and areas like that, but yet this BTU tax I think might have a devastating impact.

Given a choice, what do you think the industry would say? Would they fare better with a rollback of the ticket tax to 8 percent or a rejection of the BTU tax?

Mr. MORRISON. I'm trying to do some multiplication in my head. It sounds to me like that is a bigger number.

Mr. WOLF. Can you look at that and get back to us for the record? There may be some trade-offs here that we will be talking about later on.

To go back to the first question I asked you about the number of jobs that have been lost in the industry—there have been a lot lost from my area. I used to represent National Airport. United pulled out and left a lot of people unemployed.

Please provide that for the record.

What is the effect on the industry of the imposition by local airport authorities of the passenger facility charges? The Chairman mentioned that they don't pass it along. How detrimental has that been to the balance sheet? What percent of it do you think has been passed along and what percent of it do you think has just been eaten by the carriers?

Mr. MEAD. It is much too soon to tell what the effect is going to be because a lot of these haven't really taken hold yet. Perhaps some of the airlines have done some proprietary internal analyses of what the effects have been.

Mr. WOLF. We had a briefing the other day the Chairman alluded to and one or two indicated that frankly they were not passing it on. They were just eating it themselves and I was just curious how you felt.

Could you submit that for the record?

Mr. MEAD. Certainly.

[The GAO response follows:]

Without examining airline pricing practices at airports following the imposition of Passenger Facility Charges (PFC), it is impossible to verify the airlines' claim that they are not passing the PFC on to their customers. In general, the ability of a firm to pass a tax on to the final consumer depends on the elasticity of demand for the good or service. If the demand is highly elastic—i.e. highly responsive to price changes, firms will be less able to pass forward any taxes placed on the good or service. In the case of air travel, business travel demand is considered to be relatively inelastic and, therefore, relatively more likely to bear the increase in taxes, while leisure travel demand is relatively more elastic, and less likely to absorb the entire tax levy. The ability to pass on the tax is also affected by competitive conditions. The airlines have substantial excess capacity at present and there is substantial price competition in many markets. As the economy recovers and excess capacity recedes, the airlines will be better able to pass along some of the tax to final consumers.

NATIONAL AIRPORT

Mr. WOLF. Let me ask you about the new terminal National Airport.

Have you looked at that? What impact would that have on ticket prices here in the Washington region?

Mr. MEAD. Yes, we are examining that. We just issued a report. We were required to look at the contracting practices at National. We found essentially that the contracting practices were pretty good but they needed some improvements. But we did not get into the issue about which you are speaking.

That issue has to do with changes in the original design of the work being done at National Airport. With the changes in that design have come cost increases. We have been asked by Senator McCain to examine what impact those changes will have on the enplanement fees. That work is in progress.

Mr. **Wolf**. And when you say enplanement fees, are there ticket prices involved in that?

What does that mean for somebody who lives in McLean and flies out of National? I would like to see it from that side. What would be the impact on the ticket price? You made the comment that these do have impacts on ticket prices. Are you looking at that?

Mr. **Mead**. The airlines would have to try to incorporate that in the price of the ticket.

Mr. **Wolf**. Could you look to see roughly what impact the terminal changes would have on the ticket price for a resident in the Washington area that flies out of here and comes back in?

Mr. **Mead**. Yes. In fact, that is one of our objectives.

DENVER AIRPORT

Mr. **Wolf**. Let's get to the Denver Airport. Given the overcapacity in the industry, what are the prospects for success at the new Denver Airport opening this year, particularly with the declining passenger statistics at that particular hub.

Have you looked at the Denver Airport?

Mr. **Winston**. We have a published study on what the effects of pricing and runway investment at Stapleton would be in terms of how much delay savings you would get from doing that as compared with building a new airport.

Mr. **Wolf**. What has been your conclusion?

Mr. **Winston**. We are better off building the runway and putting in congestion pricing at Stapleton rather than building the new airport.

Mr. **Wolf**. So the Congress and the Bush Administration and Secretary Skinner made a blunder by supporting that airport?

Mr. **Winston**. That is an understatement.

Mr. **Wolf**. Do you think the Committee should do anything?

My sense is that the current Secretary has a little interest in it, so I am a little worried that there won't be the objectivity.

If Stapleton is allowed to remain open—and there is a move now underfoot to keep Stapleton open—in addition to the new airport, what impact will that have on the Denver hub and on the industry in general?

Mr. **Mead**. It would have quite an effect.

Mr. **Wolf**. Could you elaborate?

Mr. **Mead**. No, I can't elaborate except that I can tell you that the assumptions on air traffic and revenues at Denver were predicated on the closure of Stapleton, both for passenger and cargo traffic.

Mr. **Mulvey**. The airlines that are committing to the new Denver Airport expect Stapleton to be closed. They certainly don't want somebody to be flying into a close-in airport while they are a good number of miles outside the city. They would be very upset if Stapleton were kept open.

I think if Stapleton were to remain open, it would have serious consequences on the financial viability of the new Denver Airport. All of our work was predicated on Stapleton being closed.

Mr. WOLF. Are you aware that there is a move to keep Stapleton open?

Mr. MEAD. No.

Mr. WOLF. There is.

Mr. MEAD. In fact, it takes me by surprise because the revenue assumptions assume that the new Denver Airport is going to get the PFC money from Stapleton.

Mr. WOLF. Do you think it would be fair for this Committee to have an amendment that says that if Stapleton Airport—that any airport funding for the balance of the airport for the construction or any improvements in the airport are contingent upon Stapleton being closed? Do you think that would be a good restraining "Vietnam War" amendment? Do you think that would be appropriate?

Knowing how devastating it would be, do you think it would be important for this Committee to restrain or restrict funds to the new airport if Stapleton stayed open?

You are actually passing the ticket price on to somebody who lives in the Denver area and somebody else.

Mr. MEAD. Mr. Wolf, I have learned over the years that these big infrastructure decisions at some point take on dimensions that are political in nature, that don't lend themselves to just an evaluator type judgment, totally objective, and so forth.

I can say that the closure of the Stapleton Airport was a major factor in our conclusion that the new Denver Airport would just make ends meet. This committee I think has the chore of ultimately making the judgment. You made certain assumptions when you funded it, I assume. But I would rather not make a political observation about whether Stapleton ought to be closed or not.

Mr. WOLF. But I think you really have to, in a way, because you are GAO. And GAO has not been reluctant to get involved in some political activities. You all were involved in the October Surprise before a lot of people knew that GAO was involved in the October Surprise. So you can't pretend that you have never been involved in any political judgment.

I am asking you, on behalf of myself, to give us an evaluation because I based a lot of my activity on your report. I respect what you said. It had such a bearing that I literally backed off on what I was doing with regard to Stapleton.

Now I think it is important that you answer the question. If Stapleton stays open, what does that do to the basis of the validity of your report? What impact does it have?

Mr. MEAD. We can answer that for you. I will be glad to answer that for you.

Mr. WOLF. We are going to be faced with it. I am thinking of offering an amendment stipulating—or making any additional funding for anything at the new Denver airport contingent upon Stapleton being closed.

[The GAO response follows:]

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GAO
United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

April 6, 1993

The Honorable Frank R. Wolf
Ranking Minority Member, Subcommittee
  on Transportation and Related Agencies
Committee on Appropriations
House of Representatives

Dear Mr. Wolf:

At the March 10, 1993, Subcommittee hearing on the state of the airline industry, you asked whether the city of Denver still plans to close Stapleton when the new airport opens, and what might be the effect on revenues at the new airport if Stapleton does not close. According to the Deputy Aviation Director in charge of Denver International Airport construction, the city has not changed its plans to close Stapleton to airline passenger operations when the new airport opens. In settling a lawsuit in 1985 brought by residents of communities adjacent to Stapleton, the city agreed not to expand Stapleton any further and to move its operations to a new airport by the year 2000. The agreement precludes keeping Stapleton open after the operations begin at the new facility.

If Stapleton were somehow to remain open and allowed to compete with the new Denver International Airport, the consequences for the financial viability of the new facility would be very serious. However, if the current plans to close Stapleton remain in effect, then the airline-generated revenues for the new airport will be unaffected. There is still some discussion over keeping one runway open at Stapleton so that Continental can continue maintenance operations there. However, since no landing fees are levied for maintenance flights, continuing such operations would not affect the revenues available to the new airport. Therefore, the only revenue-related issue that remains is how much money the city can generate from the sale or lease of Stapleton to help finance the new airport.

In our 1991 report, we found that the City's estimate that $100 million would be generated from the sale of Stapleton was not supported by any analysis and was not part of our evaluation of the financial viability of the new facility. Revenues from the sale of Stapleton remain uncertain, but airport officials are more optimistic today because some potential users have shown solid interest in the site. Airport officials told us that the city has been contacted by United Airlines regarding the possible use of concourses A and D for its Reservation Center. Also, the shortage of available warehouse space in the greater Denver area has led to numerous inquiries regarding the possible use of the hanger space at Stapleton.

If you have any additional questions regarding the closure of Stapleton, please feel free to contact me on (202) 512-2834.

Sincerely yours,

Kenneth M. Mead
Director, Transportation Issues

cc: The Honorable Bob Carr

EFFECT OF SERVICE/MANAGEMENT ON AIRLINES' PROFITS

Mr. WOLF. Let me just ask a few more questions. I am taking up a little more time.

What impact does the service have—clean planes, good service—on this whole issue as to what airlines are doing well and what airlines aren't doing well?

Mr. WINSTON. You mean service quality, reliability, and things like that?

Mr. WOLF. Yes.

Mr. WINSTON. We have looked at a variety of ways on determinants of travel demand, and also the profitability. Certainly frequency, on-time performance, complaints, and these kinds of things have an effect on carrier choice. But when we looked at determinants of profitability, we sort of broke it up into a variety of characteristics of the carriers. That is, we looked at operating characteristics in terms of their own costs and quality of the network and also their management as we measured by years of experience in the industry, years of experience with the carrier, education background, and what have you.

We basically found some idiosyncratic results for almost all the effects except for the management effects. If those carriers that were performing poorly had the following characteristics of those carriers that were performing well, would their profits go up or down? That is the experiment we ran.

Basically, sometimes it would help them if they had Delta's wages and sometimes it wouldn't. Sometimes it would help them if they had American's cities and traffic density and sometimes it wouldn't.

But one thing that consistently seemed to come across was management. If the weaker carriers had a characteristic of the stronger carriers' management, their profits would consistently be higher.

Service is certainly important because it is idiosyncratic as to who has better and who has worse. What seems to be something that is quite important is management, and that is consistent with our earlier observation that layered on top of all the problems the industry has had are very idiosyncratic things that one would have to look at.

AIRLINE PRICING

Mr. WOLF. That was the next question that I had.

I flew Pan Am once over to Europe. We were on our way to Sudan, I believe. I remember that the seal in the door was broken—certainly not a safety problem, I am sure—but it was so cold. The light above didn't hit where you were reading. It hit on the aisle. There was not a Pan Am flight going on into Sudan. I think we took Swiss Air or something. The contrast was very, very startling.

Obviously, in fairness to Pan Am, they were having a problem. Their flight attendants were just as good, and actually better. But the plane itself was really worn. A lot of people I think would say, "If I have to pay roughly the same, I am going to go with one that is doing better."

So if you have any studies like that or anecdotes or anything like that, I would like to see them.

The last question I have is to get into what the Chairman said on the pricing. I have had a lot of people say to me, "I can't figure out the pricing."

When we're taking a private trip, my wife or I get on the phone and call around. But it is hard. Sometimes I will just call a travel agent in Vienna that we use and tell them to get us the best price they possibly can. I rely on the travel agent to do it.

How do you find—what margin, what rule can the average person use to get some semblance of pricing so that, if not getting the best buy every time, they can at least come close to knowing they are getting the best buy most of the time? Is there a rule of thumb? Is there a transparent piece of paper you can put over it that will give you the key?

I think people are frustrated. You can sit on the plane next to somebody who has paid a totally different price than you have because they have used these packages.

I had a young man on my staff who just left. He is going on a mission project to Romania. He got this thing called—I forget the name of it—he can fly to any five cities real cheap but there were conditions.

Is there anything the industry could do to give some order whereby people could judge?

Mr. WINSTON. I would break down the problem two ways. One, there is a group of people who travel a lot. One of the things about air transportation that should be kept in mind is that travel is extremely concentrated. It is something like 4 percent of the travellers do 40 percent of the travelling. So you have a lot of people up there that are always up there travelling. These people will give you fares for 100 different flights and they know what is going on.

The second group would be occasional travellers, but so much of it is driven by frequent flyer mileage in the sense that a lot of what people do, particularly for pleasure trips, is they see how many miles they have. They're going to call the carrier that they are picking up miles on. That is going to be a big influence on their choice.

So we are really left with the very occasional person who is not racking up miles. Then you're breaking it down to whether this is a pleasure trip or a business trip. If it is a business trip, then pretty much you have unrestricted travel and you're not going to be able to do too much in terms of shopping around to pay extremely low fares. On the pleasure trip, obviously, you have things where you can get your Saturday night stay, you can get your advanced purchase, and what have you.

To be honest with you, you get information disseminated immediately through newspaper ads. When you see big discounts—especially if you have the planning capabilities so that you could wait, that is certainly something you should start with.

I think it is a bad idea to call a travel agent or an airline without knowing anything in advance. You identify a big ad saying, "I saw American is going to Florida for $298. Can you do better?" Start with some basic point so that you have a rough idea.

People who travel a lot will in their mind say that if they are travelling 2,000 miles they will not pay any more than 8 cents a mile. People think that way. If I am on an unrestricted flight, I am going to cap it at 25 cents or 30 cents a mile. That would be the framework I would use.

SOLUTIONS TO IMPROVE/BENEFIT AIRLINE INDUSTRY

Mr. **Wolf**. Let me just ask these last two questions. They can probably be answered in a word or two for both of them.

What do you think is the best-run airport authority in the country? Secondly, if you had to do something for the airline industry and you were faced with making a decision on it, would you do nothing? Or what would be the one thing you would do to help?

Mr. **Morrison**. I can answer the second question. I really have no expertise in the first question.

By and large, I would do nothing for the airline industry.

Mr. **Winston**. I think I would be quite vigorous on efficient pricing investment. I think that would do a lot not only to the service quality but I think it would also help on operating costs for the carriers, too. I think there are benefits to the carriers that have not been pointed out in this hearing. Congestion pricing will smooth traffic. That would be the thing that I would emphasize.

Then I would also carry it out to roads, too. We would never even consider things like IVHS and the like, which would be an even worse thing to do. That is beyond this, but I wanted to say that. [Laughter.]

Mr. **Wolf**. What about an airport authority?

Mr. **Winston**. I can't comment on that.

Mr. **Wolf**. That's important, though, because we have been talking about airport authorities.

Mr. **Mead**. We were discussing earlier areas that the Appropriations Committee can stay on top of that would have a beneficial effect on the industry without directly intervening and regulating the prices and so forth. I think considerably more attention could be paid to the airport improvement grant program and what that program is accomplishing or is not accomplishing. I think we would be in much worse shape had it not been for the efforts of this subcommittee. I would encourage you to keep up those efforts.

I would be very careful about tinkering with bankruptcy laws at this time. I don't think reregulation is the answer.

Concerning your question about the airport authority, I don't feel comfortable saying which one, but I can say that I have been impressed with Chicago O'Hare. People may say, "My God, this place has all these delays," but it is an enormous chore those people carry out.

Mr. **Mulvey**. I, too, have a hard time answering the airport authority question, but in terms of what I would do for the industry, I agree with Cliff and Steve about how well deregulation has worked overall in terms of benefitting the airlines and the consumers. We are concerned that these benefits be preserved and we believe that these benefits are predicated on continued competition. We think that efforts could be undertaken that would help to preserve competition by looking at some of the entry barriers that exist and taking whatever remedial steps are possible and reasonable to lower those barriers so that we continue to have a successful experience with deregulation.

So actions that promote competition would be my solution.

Mr. MORRISON. The ensuing several minutes has given me a chance for reflection.

I would say that what could be done to help the industry—this industry or any industry—is to make sure that regulations such as safety, drug testing, et cetera, be subject to a cost/benefit analysis to make sure that the benefits that accrue from the regulation, which no doubt are positive, are nonetheless bigger than the costs to the carriers and whoever else of doing that.

Likewise, I mentioned earlier high-speed rail. In and of itself, high-speed rail should be subject to a cost/benefit test. If the benefits are bigger than the costs, then maybe it is worth subsidizing. But as I pointed out, there are other ways to achieve those same benefits through the congestion pricing of airports and the congestion pricing of highways.

Mr. WOLF. I thank all the witnesses.

Thank you, Mr. Chairman.

CONGESTION PRICING

Mr. CARR. I have just a couple of wrap-up questions and then we will take a short break before we proceed to the next panel.

I am intrigued by the whole idea of congestion pricing. I would like to talk to you in some other forum and learn more about it, particularly as it applies to surface transportation.

The worry that I have, though, is that congestion pricing in a highway situation leaves the control but also the burden on a particular motorist. The motorist has the option and control to avoid the congestion if the motorist wants to. He would be the one who would pay if they chose that option.

The problem I have with congestion pricing in the airline industry has to do with the fact that we already know—maybe you haven't decided, but I think I have heard enough evidence—that airlines are paying the passenger facility charges (PFC's). It is an airline facility charge. It is an AFC, not a PFC. A lot of the things being purchased with PFCs have nothing to do with passengers. So it is really an AFC, and airline facility charge. The airlines are eating it.

In the network environment at hubs, which are almost by definition during certain times of the day, you are running toward the peak. What makes us think that congestion pricing is going to even the flow? What makes us think that congestion pricing is going to be passed on to the passenger? It's really not.

The passenger doesn't have the same control in air travel that the passenger does as a motorist. The motorist can avoid congestion. But if you are flying through a hub, you are flying through congestion.

I am not real sure I understand how congestion pricing would help the situation.

And one final thought, if you did congestion pricing, would you do it in lieu of the ticket tax? You would eliminate the ticket tax and move toward congestion pricing instead?

Mr. MORRISON. When we talk about congestion pricing, we are talking about pricing airport congestion, which revenue ought to be sufficient to fund airport projects, airport investment. That leaves aside an issue of air traffic control, which you may want some kind of a ticket tax on to fund—or better yet, some other kind of peak load pricing of air traffic control.

I think imposing congestion prices tomorrow would do the industry no good. I think it is something that is in the long-term best interest of everybody of making efficient use of the infrastructure that we have.

The interesting thing about hubs and congestion pricing is that they are somewhat special because the economic basis for congestion pricing is to make me pay for the delay I impose on you because I don't take that into account.

At a hub, particularly a concentrated hub, USAir at Pittsburgh is delaying USAir. They are taking that into account already and there would be little or less basis for imposing a charge on an airport that is dominated by one carrier because they have already factored into their own decisions on scheduling the delay that they themselves will impose on their other flights.

Mr. WINSTON. Let me step back and talk in general terms about the framework of congestion pricing.

One, congestion pricing is not designed to minimize congestion. That may sound strange. It is designed to maximize economic welfare. The fact that congestion, per se, is not going to be reduced is not thought of, necessarily, as a detriment to congestion pricing.

Secondly, it is crucial to think about congestion pricing—or any pricing of an infrastructure facility—in conjunction with efficient investment in that facility. In any infrastructure you talk about, you can't separate them. In other words, on the highways we talk about efficient congestion pricing of cars, but then you have to worry about efficient investment in capacity—the number of lanes of the road.

In the trucks area, it is not congestion but a different demand on the infrastructure which they call axle weight taxing on the trucks in conjunction with optimal durability thickness of the roads. With airports, it is efficient congestion pricing on the take-off and landing for the airplanes, but then efficient investment in the number of runways.

The two of them work together. With the efficient pricing, that places less strain on capacity and often times you will not need as many lanes, or as many runways, or quite the depth on the thickness of the road. On the other hand, though, if you worked on the efficiency of the investment in the facility, you would get more runways, then the delay that any individual carrier imposes is actually reduced because the capacity is now bigger. Similarly on the cars. When you have more lanes, the congestion will be reduced. Trucks do less damage to thicker roads.

You get them both working together and two good things happen. One, you are sort of doubling the efficiency in terms of minimizing delay, but then in terms of the redistribution or the burden of the price, that is reduced dramatically.

In the highway area, I can quickly point out that if you put on the axle weight taxes on the trucks but you build the roads thick enough, it will place no burden in the long-run on the trucking industry.

We have similarly found on our congestion pricing at airports, coupled with efficient investment in getting more runways, assuming feasibility, that it actually places no burden on the airlines. Effectively, their prices won't change because they will be paying for congestion, yet the congestion is less because there is more capacity.

That is not true for general aviation and the commuter people, so there will be a burden there.

But the point is that you really have to think both pricing and investment together. It will soften the redistribution. So in that way it really won't be a burden on the mode that uses the infrastructure. It will actually maximize and promote the benefits even further. Then the returns will be that much greater.

Then most importantly, it will then postpone if not eliminate the need for more massive investments like new airports, whole new highways, new transportation systems, et cetera, et cetera. That is the long-term vision of this, but actually in other areas of the country they are starting to think about imposing these kinds of things.

REFORM OF FAA'S PROCUREMENT PROCESS

Mr. CARR. Mr. Mead, how much improvement can be made through reform of FAA's procurement process, and what specific reforms would be helpful?

[The GAO response follows:]

It is difficult to determine how much improvement in airlines' financial positions could result from FAA's reform of its acquisition process. Compliance with Office of Management and Budget (OMB) Circular A-109 is not a panacea. Rather it will help minimize the risks of cost, schedule, and performance problems. In line with the concept of Total Quality Management, which FAA has embraced, the agency should focus on continually improving its acquisition process. Based on our work reviewing justifications for capital investments, we are encouraged by FAA's commitment to change but the agency still has far to go. As we stated in our response to the first question, FAA should follow a more disciplined process in defining its needs, analyzing alternatives, and setting priorities.

IMPLEMENTING WEATHER-RELATED TECHNOLOGIES

Mr. CARR. As you know, the National Weather Service and the FAA share responsibility over the development and procurement of weather-related ATC equipment. For example, the automated surface observing system is being developed by NWS, but its major customer is the FAA. It is FAA that receives feedback on the need for this system by the aviation industry, but they don't control the development of the system.

Does this split responsibility contribute to problems in implementing weather-related technologies?

[The GAO response follows:]

We have no evidence to indicate that split responsibility between NWS and FAA is a significant concern.

ADVANCED AUTOMATION SYSTEM BENEFITS

Mr. CARR. The GAO has spent a lot of time over the past few years looking at the AAS program, at the request of this Committee. As the costs have mounted and schedules have been delayed, this program has consumed additional resources which could have been used to invest in other projects directly benefitting the air traveller.

During these delays, the FAA has maintained the support of major air carriers by insisting that AAS would provide the rapid calculation and approval of fuel efficient routes, with large estimated fuel savings for the airline industry.

In your opinion, how likely is it now that AAS will be able to provide such benefits, at least by the end of this century?

[The GAO response follows:]

Under the current AAS schedule, FAA will not be able to provide services from the Automated En-route Air Traffic Control (AERA) until past the year 2000. AERA is the part of AAS designed to provide capability for controllers to provide user-preferred routes which would provide fuel savings for airlines and other system users. FAA and IBM have recently discussed accelerating some AERA functions to work with the Initial Sector Suite System (ISSS) to be more responsive to the airlines' needs. They expect to make a decision in the next few months. We plan to monitor any changes as part of our current work for your Subcommittee. However, ISSS will not be fully installed until 1998, so at best, AERA benefits will not be available until near the year 2000 in any event. To assess the extent of benefits from user-preferred routes, we await the Volpe National Transportation Systems Center's benefit-cost study on AAS requested by your Subcommittee.

FAA'S RESEARCH, ENGINEERING AND DEVELOPMENT PROGRAM

Mr. CARR. The FAA has a research, engineering, and development program, which should be able to provide benefits indirectly to the airlines. In many cases, though, the products of this research are used to impose additional costs on the airlines through regulation, rather than providing technologies which could help reduce their costs.

Could improvements be made in the way FAA invests its RE&D dollars in order to help the airlines provide more cost-efficient and safe service?

[The GAO response follows:]

FAA's Research, Engineering, and Development (RE&D) Program plays an important role in ensuring the safety, security, and efficiency of the air transportation system. A recent industry review of FAA's RE&D Plan found that FAA's plan offers a sound approach for upgrading the nation's air transportation system. We recently reported that specific improvements FAA could make include: Integrating RE&D goals into other FAA programs such as the Capital Investment Plan; making better use of research conducted by NASA, the Department of Defense, and the private sector; and ensuring human factors issues are examined at all stages of technology research, development, and implementation.

AIRPORT LANDING FEES

Mr. CARR. The Air Transport Association believes that increases in airport landing fees have contributed to the industry's financial condition. Their data indicate that landing fees, based on cost per capacity ton landed, rose from about $5 in 1980 to over $10 in 1992. They believe this reflects the addition of costly terminals and other airport facilities which often add little to airway system capacity. These facilities are funded both by FAA airport development grants and, since 1990, by passenger facility charges.

Do you agree with ATA's argument? Why or why not?

[The GAO response follows:]

We have not examined the extent to which higher airport fees have contributed to the industry's financial problems. In the case of the new Denver airport, our September 1991 report stated that operating and maintenance expenses are expected to increase from $69 million in 1989 at Stapleton airport to $105 million in 1994 at the new Denver airport. The higher expenses are primarily due to the increased size of the terminal complex. The airport fees and charges to the airlines at the new airport, per enplaned passenger, are expected to be $13 in 1995, or about 5 percent of average airfares. Current costs at Stapleton are about $6 per enplaned passenger.

FAA'S AIRPORT MODELLING TOOLS

Mr. CARR. You've done work over the past couple of years on the new Denver Airport, the Front Range Airport—also in Denver—and the planned new Chicago Airport. From your work, would you say the FAA has adequate modelling tools to determine the impact of large-scale airport projects such as these on our airway system or the affected airlines?

[The GAO response follows:]

The limitations of FAA's modelling tools are well known. Recognizing these limitations, FAA's research and development program intends to build a national simulation capability. FAA will be holding its first aviation modeling international symposium in June 1993 to discuss the state of the art of simulation.

Over the past few years, GAO has reviewed a number of proposed airport development projects, including the new Denver airport; the expansion of Front Range airport; the expansion of Detroit City airport; and the development of a new Chicago airport. FAA's current models were used to analyze the potential impacts of the new Denver and Chicago airports on air traffic delays. Regarding Denver, FAA tried to assess the new Denver airport's ability to reduce delays systemwide using the National Airspace System Performance Analysis Capability model. We found FAA's modeling capability to be of limited value in determining the impact of large-scale airport projects on the national airway system.

FAA recently began to develop a systemwide delay model for analyzing the effects of capacity improvements at individual airports on the total system. However, this model will only contain weather and delay data based on one day. Therefore, the model may not be able to show how improvements will impact on the total system because it may not be representative of the variety of weather and delay conditions that exist systemwide over time.

DATA ON AIRLINE INDUSTRY LOSSES

Mr. CARR. According to data compiled by the GAO, the airline industry lost $8.4 billion between 1987 and 1992. However, you point out that this large aggregate figure is skewed by the huge losses suffered by a few airlines. For example, half of these losses—$4.2 billion—were experienced by carriers no longer in business, Eastern and Pan Am. While it is true that no major carrier except Southwest Airlines was profitable in 1992, does your data indicate that the oft repeated $8 billion figure may be a little misleading?

[The GAO response follows:]

Our data should not be interpreted to mean that the losses experienced by the industry are not serious. They are, but some airlines have been hurt more than others. The Big Three (American, United and Delta) account for 58 percent of the traffic and, except for a small profit recorded by United in 1990, all three have reported losses in each of the past three years. However, removing the losses associated with FAS 106 (a federal accounting standard that requires that airlines' financial records more accurately reflect the expected costs of benefits offered to retirees), the Big Three lost $2.27 billion of the $7.91 billion lost by the industry between 1990 and 1992. Thus, the carriers with 58 percent of the market experienced 29 percent of the losses. Our concern is that a sufficient number of airlines survive to ensure that the benefits to the travelling public from the competition spawned by deregulation continue.

LEVERAGED BUY-OUTS

Mr. CARR. To what extent do situations such as the leveraged buy-out of Northwest Airlines contribute to the industry's loss figures?

[The GAO response follows:]

Leveraged buy-outs, such as that for Northwest Airlines, raise a firm's debt burden and can reduce profitability. We have not analyzed the relative contribution to the debt burden from leveraged buy-outs. Airlines that have been subject to leveraged buyouts, such as TWA and Continental, have higher ratios of long term debt to total capitalization and presumably greater debt burdens. Comparable data for Northwest Airlines are not available as our data are drawn from company reports and Northwest is no longer publicly traded. Finally, while the added debt burden from leveraged buyouts could be a factor partly explaining the poor financial performance, even airlines like United and American that have not had leveraged buyouts have sustained substantial losses.

CAUSES OF FINANCIAL PROBLEMS

Mr. CARR. Your statement before the Public Works Committee concluded as follows:

"To the extent that a specific firm's problems stem from mismanagement or inefficiency, its distress reflects the natural processes of the marketplace that favor the efficient, well-run business over an inept competitor, and government intervention harms the consumer by keeping inefficient suppliers in the industry."

To what extent do you believe this to be the cause of financial distress in the domestic airline industry?

[The GAO response follows:]

Each airline bankruptcy can be traced to different causes. Some of the financial problems faced by individual carriers probably are the result of ill-timed or poorly conceived management decisions. Some airlines fared poorly because they were unable to get control over their high operating costs, others never successfully adapted to the changes in the competitive environment brought about by deregulation. We have not attempted to address the role of airline management in the industry's financial condition. A hallmark of a market economy is the freedom to fail and leave the industry as well as the freedom to succeed. Government intervention to prop up uncompetitive firms can undermine the financial and competitive health of the other firms and harm consumers.

On the other hand, there are two caveats to this observation. First, some of the problems that bankrupt airlines encountered trace either to prior government actions (the pre-deregulation restrictions on Pan Am's development of a domestic feed system) or on barriers to competition erected by the strongest and largest airlines (computerized reservation systems, frequent flyer programs, control over gates and slots at key airports, etc.) An ill-timed move that might be merely costly for a well-situated airline, could prove disastrous to one poorly positioned. Second, deregulation and reliance on competitive markets for setting fares and service in the airline industry was predicated on the presumption that entry into airline markets was relatively easy. Over time, the incumbent airlines have erected barriers making it difficult for new firms to successfully enter the industry or for existing firms to expand into markets dominated by others. Thus, it would be difficult if not impossible to disentangle managerial decisions from the environment in which they were made. The Congress and the administration need to reduce anticompetitive barriers so that the airline industry continues to be an efficient, market-driven industry.

IMPACT OF NEW FINANCIAL ACCOUNTING STANDARDS

Mr. CARR. Your data also indicate that, even though 1992 was a particularly bad year—$4.4 billion in losses—about half of the losses for those airlines reporting full year financial results was due to application of a new financial accounting standard—

FAS106—which changed the way medical and life insurance benefit costs are recorded.

To what extent do "book losses" such as those reflect underlying weaknesses in the airline industry?

[The GAO response follows:]

These one-time adjustments affected firms other than airlines as well and probably do not reflect any particular "underlying weakness" in the airline industry. Because these are one-time charges, they will not have a continuing impact on long-term profitability. The changes made by the new federal accounting standard (FAS 106) should serve to improve the stability of airline retirement plans. FAS 106 will require that airlines' financial records more accurately reflect the expected costs of benefits offered to retirees in the future and will thereby encourage sounder decisions.

FAA'S COST/BENEFIT ANALYSIS OF NEW REGULATIONS

Mr. CARR. Let's talk for a second about the impact of FAA regulations on the industry. We've heard of some regulations, often well-intentioned, which put burdens on an airline industry already subject to intense price competition, low profit margins, cyclical revenue patterns, and heavy debt loads. It is not clear that the benefits of these regulations are always worth their cost.

In your work, have you seen cases where the FAA pursues, without statutory mandate, regulations without adequate benefit/cost justification?

[The GAO response follows:]

We have not reviewed the adequacy of FAA's cost-benefit analysis in proposing and justifying new regulations. In performing a cost-benefit analysis, FAA uses values provided by OMB and the Department of Transportation (DOT). FAA also uses values that, according to its publication *Economic Values of Federal Aviation Administration Investment and Regulatory Programs,* are based on economic theory, empirical investigations, and data from government, private, and academic literature. These include the value of time in air travel, aircraft capacity and utilization factors, and unit replacement and restoration costs of damaged aircraft. Both OMB and DOT review FAA's proposed regulations, including the cost-benefit analysis. Additionally, the public is invited to comment on all proposed regulations. We do have one concern about the cost-benefit analyses associated with FAA's aging aircraft regulations. We found that FAA relied on industry cost-benefit estimates and did not perform independent assessments.

AIRLINE COSTS

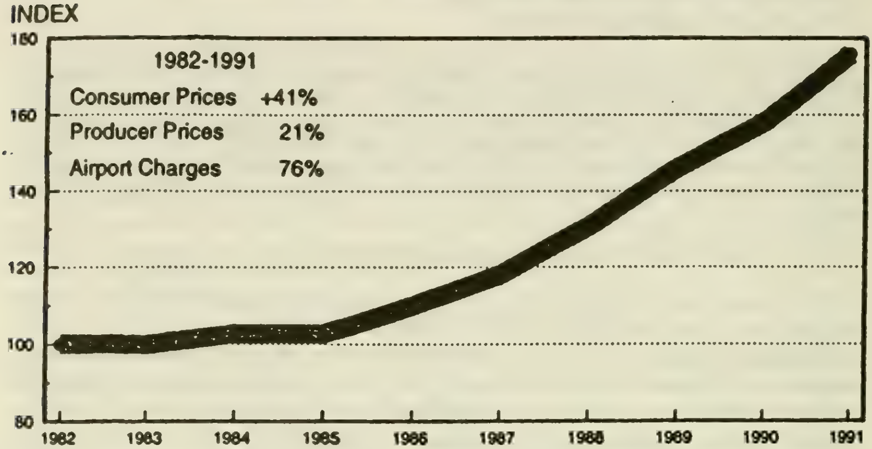
Mr. CARR. Mr. Winston and Mr. Morrison, as the following chart shows, airport landing fees and rental costs have been rising rapidly. Other data indicate that major air carriers paid approximately $1.2 billion in landing fees in 1991, compared to $592 million in 1981. Most of the increase came not from additional traffic, but from rate increases much higher than normal inflation growth.

Would you say the air traveller is benefitting proportionately from these increases, or do they represent a disturbing trend?

[The chart and Morrison and Winston response follow:]

AIRPORT CHARGES RISING RAPIDLY

Landing Fee and Rental Costs per Passenger



Air Transport Association

In the short run, the rising airport charges are a burden to the airlines but in the long run they will be passed on to travelers. They are not necessarily a disturbing trend, but they don't provide much benefit to travelers. Congestion pricing is a much more appropriate way to charge carriers for airport use.

PASSENGER FACILITY CHARGES

Mr. Carr. Will the increasing approval of PFCs pose an additional burden to air carriers, and do you see any evidence that air carriers are absorbing the PFCs rather than passing them on to the customer?

[Morrison and Winston response follows:]

In the short run, PFCs will be an additional burden to carriers, but in the long run they will be passed on. In the long run, competitive industries, such as airlines, pass on the bulk of a "tax increase." The real problem with PFCs is that they are *not* congestion prices and thus do not ration scarce peak hour capacity.

CONGESTION PRICING

Mr. Carr. The airlines often talk about the negative effects of airway congestion and capacity limitations. We also have congestion on our Nation's urban and suburban highways. However, much of this problem—in both modes—is not steady state, but occurs during peak periods. You have written that the most efficient way to address peak hour congestion is through changes in airport pricing and investment policy. What exactly do you mean, and how would they benefit the air traveller?

[Morrison and Winston response follows:]

Congestion pricing charges vehicles (planes, autos) for their use of scarce infrastructure capacity (road lanes, runways). Efficient investment builds the optimal number of lanes and runways (by trading off the cost of additional capacity against the reduction in delay costs it will bring about). Travelers benefit from this policy through lower travel times and less delay. Carriers benefit from reduced operating costs. The congestion prices (tolls) are typically higher than current user fees, but the cost of these increased prices is more than offset by the benefits from reduced travel times and operating costs.

Mr. Carr. Congestion pricing would result in higher prices being charged during peak hours, with discounts during non-peak hours. In the case of air travel, this could "smooth out" demand, thereby reducing the need for new airport facilities. Do you support this concept? Why?

[Morrison and Winston response follows:]

As indicated above, we support congestion pricing because it is the most efficient way to allocate scarce infrastructure capacity. We stress that efficient investment should accompany efficient pricing. Both policies work together to provide time savings to travelers and lower operating costs to transportation providers, while minimizing the price increase for use of the transportation facility.

TECHNOLOGIES TO REDUCE ATC DELAYS

Mr. Carr. We hear a lot about how the Government could do more to reduce air traffic control delays. Could you comment on any specific technologies which offer particular promise in this area?

[Morrison and Winston response follows:]

It is essential that the government use a cost-benefit framework to assess any promising technology. Microwave landing systems and high speed runway exiting should be evaluated within this framework. Of course, congestion pricing and organization change of the FAA, through a private air-traffic control system, could also reduce delay.

AIRLINE MANAGEMENT

Mr. Carr. Mr. Winston, you were quoted in Congressional Quarterly a few weeks ago as saying about the airline industry: "You've got a lot of talented CEOs there and they're having problems. For 40 years someone else was telling them what to do. Now they're going to have to figure their own way out."

To what extent are the current problems the result of poor forecasting and bad management by the airlines?

[Morrison and Winston response follows:]

Current industry problems have been exacerbated by over-zealous expansion and questionable management decisions (e.g., debt acquisition). In good economic times, these problems would not have been sufficient to cause the industry to lose several billion dollars in a few years.

Mr. Carr. To what extent can the collective industry failure be explained by unique problems with individual carriers instead of structural problems within the industry as a whole?

[Morrison and Winston response follows:]

Individual carrier problems (generally related to excess debt and over-expansion) have combined with the industry's overall problems in these areas to exacerbate the problems caused by a weak macroeconomy.

Mr. Carr. You have both noted the growth in air carrier fleets between 1985 and 1990. As you state, "the result was tremendous excess capacity and downward pressure on fares. When the industry has completed its shake-out, it will adapt more efficiently to the business cycle."

Do you believe that the best path now is for the Government to allow market forces to work without Government assistance?

[Morrison and Winston response follows:]

The government should work to ensure markets are working efficiently including infrastructure facilities (where efficient pricing and investment should be promoted), international markets (where deregulation should be promoted), and financial markets (where bankruptcy enforcement policy should be re-assessed).

Mr. Carr. If the "Big Three" had not expanded their fleets by a significant percentage over the past 5 years, would they be showing a profit today?

[Morrison and Winston response follows:]

In hindsight, carriers might be profitable today if they had not over-expanded but this ignores the inherent risk in any investment decision in the airline industry. There is frequently greater risk in *not* expanding, especially if your competitors are expanding. From a risk (cost-benefit) perspective, the airlines were arguably correct in pursuing the expansions they did. Hopefully, the industry will draw on its past experience to more effectively factor in the downside risk of expansion.

AIRLINE COMPETITION

Mr. Carr. In some of your writings, you both have made a distinction between competition nationally and competition at the route level. You have compared the airline industry to the beer industry, which has only five major national competitors, but vigorous competition in local markets, that is, stores and bars.

Would you explain this distinction to us and tell us why it is significant?

[Morrison and Winston response follows:]

Prices are determined by the intensity of competition in the markets where prices are set. In airlines, fares are not set at the national level but on individual routes. Thus, the relevant measure of competition is at the route level where competition actually occurs.

SOUTHWEST AIRLINES

Mr. CARR. One major air carrier has bucked the industry trend and continued to make a profit—Southwest Airlines. What is Southwest's secret, and could any of those strengths realistically be applied to the other major air carriers?

[Morrison and Winston response follows]

Southwest has low operating costs, entry barriers at a critical airport in its network (Love Field), and does not interline with other carriers. They are an effective niche carrier (so is Alaska Air), but it is not clear they could be as an effective national carrier. They are well-managed, but so are the Big Three (American, United, and Delta). The Big Three face a more challenging environment because of their size.

CLOSING REMARKS OF FIRST PANEL

Mr. CARR. I want to thank all of you for the time and attention you have given to the concerns of this Committee. I have learned a lot. I suspect this has been somewhat beneficial. As we mark up our fiscal year 1994 appropriations bill, I am sure we will talk about what we have learned from this panel. I want to thank you very much for being here.

We will take a short 5-minute recess and have the other panel assemble and give us all a chance to stretch.

[Recess.]

INTRODUCTION OF SECOND PANEL

Mr. CARR. On our next panel we welcome Mr. Edward A. Merlis, senior vice president for external affairs for the Air Transport Association; Michael Durham, chief financial officer of American Airlines, Mr. Elliott Seiden, vice president for Law and Government Affairs of Northwest Airlines; and Mr. Glen Zander, co-chief executive officer of Trans World Airlines.

Thank you all for being here. I really appreciate your taking the time. I know that for many of you, you have operational duties and other things you could be doing. That you would share the time with us is most appreciated.

We will begin with Mr. Merlis as the representative of the association of which all these airlines are members.

Mr. MERLIS. Thank you, Mr. Chairman. You have my written statement.

STATEMENT OF EDWARD MERLIS

Mr. CARR. I do and I have read it. It will be included in its entirety in the record.

Mr. MERLIS. I will just summarize.

We appreciate this opportunity to appear before you to discuss the financial health of the commercial airline industry and to suggest some steps this subcommittee and the full Appropriations Committee could take to improve the health of the industry.

As I am sure you know, Mr. Chairman, losses for U.S. air carriers totalled over $4 billion in 1992. Over the past 3 years, the industry has lost a combined total of more than $10 billion. With that background in mind, we have a number of recommendations that would assist the airline industry in reversing this situation and approaching some return to profitability.

First, I would like to focus on modernization of the air traffic control system, an area that can result in a significant reduction in airline operating costs. Since the air traffic controllers' strike, U.S. aviation has bounced along with delays averaging 900 to 1,100 per day. It is only recently that there has been a measurable decline in the delays to 770 per day for 1992.

That achievement, however, is tempered by the decline in departures which have occurred during this recent period of traffic stagnation. Fundamentally, since 1988, there has been very little growth in air transportation in the United States.

What will happen when the economy improves? We fear without appropriate efforts being put forth into reducing the systemic causes of air traffic control delays, these delays will bounce right back up again to the 900 or 1,100 or even greater range. When it comes to enhancing the economic condition of the airline industry, improvements in air traffic control can have immediate payback. Elimination of current ATC delays would result in the elimination of an estimated $2 billion in annual airline costs.

One persistent myth, though, about system delays holds that pouring more concrete for runways and taxiways, or the building of new gates, is the answer. However, well-intentioned discussions about the need for more runways and construction using other AIP-funded projects to solve the delay problem is misdirected. Three-fourths of all delays—whether they are figured by event or time of delay—occur in the taxi-out and airborne phase, two areas which are clearly susceptible to improving the ability of the ATC system to handle congestion.

A natural consequence of reducing delays during those two segments of flight is a reduction in gate delays and a reduction in any necessity for further gate construction.

Weather is a primary source of ATC delay, but even weather-related delays are susceptible to technological development. This Subcommittee has already played a critical role in addressing delays of this type by providing funding for precision runway monitors, or PRMs. Once fully operational, these PRMs will allow for increased use in inclement weather and operating efficiency of existing runways.

Slowing the system down to deal safely with volume through the imposition of flow control or other techniques is not an appropriate solution to the problem. That response, whether interim or long-term, clearly doesn't solve the delay problem. It merely copes with it.

Unfortunately, ATC delays are not the only Government-imposed cost being placed on the backs of air carriers. Major increases in AIP spending are leading to rapidly escalating airport costs, which are adding to the financial distress of the industry. While the airline industry is proud of the role it plays as a catalyst supporting airports and communities and economic development and expansion, such support can only be provided when a number of factors are in place to create the appropriate climate for expansion, principally, realistic economic planning on the part of local authorities.

Unfortunately, many local officials lately have been following the field-of-dreams mentality that if you build a world-class airport the airlines and industry will come. Airlines cannot afford to finance and otherwise support this type of speculative over-building since it is airlines, Mr. Chairman, not the local community or the local taxpayers, that pay for the non–Federal, non-airport improvement program portion of airport construction costs and the tremendous ongoing operation and maintenance costs which over time often dwarf the capital investment.

With respect to airport costs, the airlines agree with many airport capacity enhancement initiatives currently underway today. What we object to and what we believe Congress should unilaterally oppose is spending for excessive gold-plated projects and the ongoing efforts of some communities to bleed off aviation-developed revenues.

We appreciate the comment you made earlier about revenue diversion.

Airport charges, rents, landing fees, and such are one of the industry's fastest rising costs. In fact, airport costs have risen five times faster than the producer price index since 1982, which itself has increased 18 percent.

As an example of airport excesses, you need only look across the Potomac River. We support the enhancement of National Airport, but not the glass-walled main terminal four football fields long, soaring to a height 1.3 times that of Dulles Airport, topped by 64 Jeffersonian domes, each have the size of the Capitol dome. This project is already $125 million over budget, even though not one spade of dirt has been turned, nor has one yard of concrete been poured for the new terminal.

Mr. Wolf asked the question earlier about enplanement costs. We already know that based on the year 2000 dollars, this construction will result in enplanement cost of $14.50 per passenger. That airport currently is operating at $3.15 per passenger. If you adjust year 2000 dollars to 1991 dollars, it would be an increase from $3.15 per passenger to $8.22 per passenger.

An example of the covetous eyeing of airport revenues would be Los Angeles where the upcoming mayoral race is shaping up to a competition to see who can figure out the most effective way to run up airport charges, impose PFCs to meet the so-called unmet needs, and then take the money out the back door to fund city expenses. Again, we understand the city's financial concerns, but we believe—and we hope you do—that the mugging of the air traveller and the shipper is not an appropriate local response to that local problem.

The cost of operating and maintaining airport facilities constructed with either AIP funds or passenger facility charge revenue will ultimately be borne by airlines and—if we were ever profitable—their passengers. Current indications are that because of the size and duration of PFC programs that are springing up all over the Nation, their costs may well be enormous. As a matter of fact, over $5.9 billion in PFCs have been approved and approximately $5.5 billion in PFCs are awaiting approval at the FAA.

For this reason, we urge the Subcommittee to exercise restraint in setting annual obligational ceilings for AIP spending, to exercise oversight with respect to the FAA's allocation of AIP funds, and to protect airport revenues from being diverted to non-aviation purposes.

I would like to talk briefly about the ever-increasing tendency on the part of Government to impose more and more costs on the airline industry through ill-conceived regulations which the industry can ill-afford.

Last year, this Subcommittee was at the forefront in the entire Congress in helping the airline industry address these kinds of regulatory burdens and initiatives. Your leadership in deflecting proposed or actual regulations in the area of drug and alcohol testing, employee background checks, and taxation of frequent flyers saved or will save the industry millions of dollars over the next few years. Unfortunately, the attitude that necessitated your intervention has not changed.

Let me identify a few of these kinds of regulations.

On the regulatory front, one of the best examples is what is known in FAR Part 107.14, the airport security access rule. I discuss that in greater detail in my written statement, but suffice it to say that FAA's official cost estimate of $168 million and the implicit assurance that practicability was no problem has already cost the airlines in excess of $500 million and we have crews unable to get to and from their aircraft without escort by local airport-based personnel, which presents potential safety and operational problems.

All this was done to address a security problem that was undocumented and based largely on a single incident. This constant regulatory excess boils down to an attitude that no perceived problem is too small or costs too great to the ambitious regulator.

Another proposal currently working its way through the initial stages of the regulatory pipeline is a requirement to install cabin water spray systems in all air carrier aircraft, an idea that the FAA's own commission study indicates would cost the world's airlines $11.6 billion. I would like to expand on this one, though, because I think it really demonstrates how questionable the proposal is regardless of the cost and regardless of the consequences.

If airlines are required to install cabin water spray systems for smoke and fire suppression in all their aircraft, the operational costs in terms of extra fuel consumed would be enormous. Aircraft in some cases would be required to carry up to 1.75 tons of equipment and water during the entire duration of every trip.

But even more troubling is the fact that if any cabin water spray system malfunctioned and the on-board water were sprayed or dumped into the aircraft cabin, the result is an almost assured loss of on-board control systems and the possible loss of the aircraft. Hopefully, this proposal will be relegated sooner rather than later to the bad ideas file at the FAA.

In an industry which has removed olives and lettuce leaves to save costs and reduced fuel burn by eliminating the unused ashtrays, the operational costs of this system amount to as many as 20 additional passengers being carried in a 747 with no additional revenue. And that is after having spent $11.6 billion to install the system.

There is one additional area in which this Subcommittee can strike a blow for U.S. citizens as well as the U.S. airlines and our employees. Here I am referring to the level playing field.

Federal Government policies, particularly in the security area, work against the interests of the U.S. airline industry. If the imposition of various requirements is truly necessary to protect U.S. citizens, recognition must be made of the fact that about half of all U.S. citizens travelling to or from this country travel on non-U.S. flag airlines. Therefore, the standards put forward to protect U.S. citizens—either in the area of drug testing, alcohol testing, security, or de-icing—must also apply to foreign carriers. To do otherwise is to deny half of all U.S. citizens travelling internationally the protection from hazards which are provided by U.S. carriers.

What can be done to preempt such ill-advised regulatory initiatives? We would urge your consideration of withholding the appropriation of funds for DOT or FAA rulemaking activities until a far more rigorous cost/benefit and economic impact analysis in support of such regulations is instituted by the agencies involved.

Additionally, we believe parties impacted by these regulatory excesses should be afforded the opportunity to effectively protest these initiatives and protect their interests in court.

Finally, we suggest you consider requiring the Executive Branch to apply the same regulatory requirements to the international operations of foreign carriers that are imposed on U.S. carriers. We will be pleased to submit appropriate language for your consideration.

Mr. Chairman, the last item in my written statement discusses our well-known views on the matter of serious FAA reform. Since the NAS plan was announced some 10 years ago, the FAA has thrown approximately $15 billion into fixing the system and yet, as I mentioned earlier, the level of delays has been reduced measurably only in the last 2 years when demand in the system went down, not when the system's ability to cope with demand went up.

Clearly, it raises fundamental questions concerning the FAA's ability to handle the innovation and development of new technology necessary to reduce delays. We remain convinced that fundamental reform—reform designed to change the entire culture of the FAA from one of a traditional bureaucracy to one dramatically more goal and achievement oriented—is not only possible, but is imperative.

Thank you very much. I will be happy to answer questions.

[The prepared statement of Edward Merlis follows:]

Statement of Edward A. Merlis, Senior Vice President
Air Transportation Association of America,
Before House Committee on Appropriations,
Subcommittee on Transportation, on
The Financial Condition of the Airline Industry
March 10, 1993

I am Edward Merlis, Senior Vice President of the Air Transport Association of America. I appreciate this opportunity to appear before you today to discuss the financial health of the commercial airline industry, and to suggest steps this Subcommittee, and the full Appropriations Committee could take to improve the health of the industry.

As I am sure you know, Mr. Chairman, losses for U.S. air carriers totalled over $4 billion in 1992. (Attachment A). Over the past three years the industry has lost a combined total of more than $10 billion. Since 1988, sluggish economic growth has run headlong into long-term fleet planning. Aircraft acquisition plans based upon historic trends of traffic growth, bumped into the invasion of Kuwait in the summer of 1990. The subsequent fuel price run up of $4 billion in two quarters was followed by the land war during which time international traffic dropped dramatically. Following the war, domestic traffic remained weak, except for the stimulus last summer of deeply discounted fares. These recent losses now exceed the cumulative earnings of the industry since 1945.

This lack of profitability has led to plummeting cash flow which has not substantially recovered from the rock bottom depths of the 4th quarter of 1990. That was a time when fuel prices were often more than double their historic base. When you run out of cash, bad things happen. Over the past three years three carriers died and three other filed for bankruptcy protection. Unfortunately, cash flow has not returned to sufficient levels.

We envision annual needs of up to $15 billion for capital additions throughout the coming decade. To accomplish this, carriers need between $7 and $8 billion in internally generated cash flow and need to obtain between $7 and $8 billion from bankers to sustain growth and replace the fleet. Our profits have been insufficient to generate the $7 or $8 billion in cash flow, and banks have been unwilling, not unreasonably, to make up for the shortfall.

With that background in mind, Mr. Chairman, I would like to make a number of recommendations for actions this Subcommittee could take to assist the airline industry in reversing this situation and returning to profitability. First, I would like to focus on modernization of the air traffic control system, an area that can result in a significant reduction in airline operating costs.

Since the air traffic controllers' strike, U.S. aviation has bounced along with delays averaging 900 to 1100 per day. (Attachment B). It is only recently that there has been a measurable decline, 770 per day for 1992, but that achievement is tempered by the decline in departures during this recent period of traffic stagnation. What will happen when the economy improves? We fear, without appropriate efforts being put into reducing the systemic causes of air traffic control delays, delays will bounce right back up again to the 900-1100 or even greater range once the industry recovers. When it comes to enhancing the economic condition of the airline industry, improvements in air traffic control can have the greatest immediate payback. Elimination of current ATC delays would result in the elimination of an estimated $2 billion in annual airline losses.

At this point I would like to address a persistent myth about system delays. Well intentioned discussions about the need to pour more concrete, build more runways, and construct other Airport Improvement Program (AIP) funded projects, to solve the delay problem are misdirected. The primary source of aircraft delays is not insufficient airport capacity, it is insufficient ATC capacity. (Attachment C). And while weather is one source of ATC delay, even weather related delays are susceptible to technological development. This Subcommittee has already played a critical part in addressing delays of this type by providing funding for precision runway monitors (PRMs). Once fully operational, these PRMs will allow for increased operational efficiency during inclement weather conditions.

We believe, however, that the biggest payoffs from delay reductions will come from reducing congestion in the ATC system. Fully one quarter of our delay problems come from not being able to handle the current number of flights. And as operations begin to grow again in a resurgent economy, this will become the choke point.

An improvement in ATC volume handling capability would improve delays more that any other initiative. Attachment "D" to my testimony shows where system delays occur, and thus where attention must be focused. While airlines have vastly increased the amount of service; taking more people at affordable prices to their destinations, the FAA has not kept pace with this growth. Slowing the system down to deal safely with volume, through the imposition of flow control and other techniques, is not an appropriate solution to the problem. That response, whether interim or long term, clearly does not solve the delay problem -- it merely copes with the problem.

Since the NAS plan was announced some 10 years ago, the FAA has thrown billions of dollars into this problem and yet the level of delays has been reduced measurably only in the last two years when demand on the system went down, not when the system's ability to cope with demand went up. Clearly, it raises fundamental questions about the FAA's ability to handle the innovation and development of new technologies necessary to reduce the delays.

We've been looking at what causes delays and where in a flight they occur. Attachment "E" identifies how much time is lost in each phase of flight. The segments that seem to offer the most promise for improvement are taxi-out time and airborne time. That confirms our view that the solution to the ATC delays is not primarily on the ground. Pouring of more concrete for runways and taxi ways, or the building of new gates is not the answer. Three-quarters of all delays, whether they are figured by event or figured by time of delay, occur in the taxi-out and airborne phase -- two areas which are clearly susceptible to improvement. And a natural consequence of improving those two segments of flight is a reduction in gate delays.

Here is another way of looking at delay time. Attachment "F" shows the average length of delay by segment of flight. Relatively speaking, there aren't many gate delays. But when you have one it's usually pretty long. Even a big reduction in gate delays has less of a payoff than a small reduction in taxi-out delays. And, of course, any reduction of delays that occurs while engines are running has payoffs in reduced fuel consumption. A secondary cost benefit in reducing taxi-out delays is the reduction in the need for more gates. After all, it is the delay in getting airborne which requires the system to keep aircraft at the gate.

We've looked at why and where in a flight delays occur. We think it's particularly important to prioritize the locations were the effort should be applied to reducing delays. Attachment "G" shows the airports with major ATC problems by amount of delay per each and every departure. Out of the 400-plus airports receiving scheduled service in the United States, efforts at reducing ATC delays at these large airports will have the biggest payoff. This baker's dozen represents only about ten percent of operations in the United States but 36% of passengers and 47% of all ATC delay time. Focusing on reducing delays at these airports, will have a much higher payoff as far as reducing system delays. I would also add to this list of locations, DFW and Pittsburgh. For while the average delay at those airports is lower than at the other thirteen, the total amount of delay time is significant.

Unfortunately, ATC delays are not the only government imposed cost being placed on the backs of air carriers. Major increases in spending from the Airport Improvement Program are leading to rapidly escalating airport costs which are further adding to the financial distress of the industry. While the airline industry is proud of the role it plays as a catalyst supporting airports and communities in economic development and expansion, such support can only be provided when a number of factors are in place to create the appropriate climate for expansion. Those factors include adequate markets for air travel, a broad manufacturing base, and realistic economic planning on the part of local airport authorities. Unfortunately, many local officials lately have been following a "Field of Dreams" mentality that if they build a world-class airport, the airlines and industry will come.

Airlines cannot afford to finance and otherwise support this type of speculative overbuilding. Air carriers must go where substantial traffic already exists. It is airlines, Mr. Chairman, not the local community or the local taxpayers that pay for the non-federal -- non-Airport Improvement Program -- portion of airport construction costs. Through fees and charges airlines also pay the operating costs for airports. If there is not sufficient traffic volume to pay the bills, carriers cannot support the facility. Bear in mind that virtually every airport project entails tremendous ongoing operation and maintenance costs which, over time, dwarf the capital investment. These costs, let alone the up-front capital costs, are too often ignored in the airport project dreams.

With respect to airport costs, I do not want to be misunderstood. The airlines agree with many airport capacity enhancement initiatives underway today. What we object to -- and what we believe Congress should unilaterally oppose -- is spending for excessive "gold plated" projects and the ongoing efforts by some to bleed-off aviation developed revenues. Airport charges -- rents, landing fees, etc -- are one of the industry's fastest rising costs. When the airport community begins to speak of all the cost containment measures they now have underway -- keep this one simple fact in mind: airport costs, have risen five times faster than the Producer Price Index since 1982 (which itself has increased 18 percent). (Attachment H). Airport costs now amount to almost $3.5 billion per year.

As an example of airport excesses, you need only take a look across the Potomac River. We support the enhancement of National Airport -- what we don't support is a glass walled main terminal, four football fields long, soaring to a height 1.3 times that of the Dulles Airport terminal and topped by 64 "Jeffersonian Domes," each half the diameter of the Capitol Dome. This, unfortunately, is typical of all too much of what some airport high rollers say is $50 billion in unmet airport need. This is the type of project which has no place in a lean, competitive and aggressive aviation industry -- indeed, this project alone is already $125 million over budget.

As an example of the covetous eying of airport revenues, you might want to take a look at the goings-on in Los Angeles, where among other things the upcoming mayoral campaign is shaping up around the question of who can figure the most effective way to run up airport charges, impose PFC's to meet "unmet needs" and then take that money out the back door to fund city expenses. Again, we understand the City's financial concerns but we believe, and we hope you do, that the mugging of the air traveler and shipper is not an appropriate local response.

The cost of operating and maintaining airport facilities constructed with either AIP funds or passenger facility charge (PFC) revenue will ultimately be borne by airlines. Current indications are that, because of the size and duration of proposed PFC programs that are springing up all over the nation, the cost to the airlines may well be enormous. The operation and maintenance cost for all these projects will ultimately be borne by airlines, through landing fees, rental charges for counter space and terminal space, and other facilities for which airlines are assessed fees. For this reason we believe it is important for this subcommittee 1) to exercise restraint in setting annual obligational ceilings for AIP spending, and 2) to exercise oversight with respect to the FAA's allocation of AIP funds. At the same time we seek your support in protecting airport revenues from diversion to non-aviation purposes.

Finally, I would like to talk about the ever increasing tendency on the part of government to impose more and more costs on the airline industry through ill conceived regulations. The constant imposition of more costs -- in the form of regulations to implement "whiz bang" ideas the industry can ill afford must stop.

Last year this Subcommittee was at the forefront in helping the airline industry address ill-conceived regulatory initiatives of various types. Your leadership in deflecting proposed or actual regulations in the areas of drug and alcohol testing, employee background checks, and the taxation of frequent flyers, saved -- or will save the industry millions of dollars over the next few years. Unfortunately, the attitude that lead to these regulatory proposals has not changed.

On the regulatory front, one of the best examples of the problem is manifest in the FAR Part 107.14, the Airport Security Access Rule. When first proposed, the carriers raised serious concerns with the practicability and cost of this program, which we estimated at $450 million. These concerns were met with an "official" FAA cost estimate of $168 million and the implicit assurance that practicability was no problem. What do we hear three years later? We have incomplete systems already costing in excess of $500 million, which will eventually total from $650 to $700 million. In addition, we have crews unable to get to or from their aircraft without escort by airport based personnel -- presenting serious safety and operational problems. And all of this to address a "security problem" that was undocumented, and based largely upon a single incident.

Again, this is just one example of constant regulatory excess -- and the attitude that no perceived problem is too small or cost too great to the ambitious regulator. Add to this example the following recently proposed, pending, or implemented regulatory burdens placed on the industry, along with their associated projected 5 year costs, and the problem for the industry becomes monumental: criminal history record checks -- $1.1 billion; aircraft performance in rejected take-offs -- $2.3 billion; airport obstacle analysis -- $1.1 billion, and type 3 overwing exits -- $1.04 billion. Other major regulatory initiatives that may be proposed for the industry in the near future, for which good cost estimates do not yet exist, include container hardening and explosive detection systems.

One potential proposal that is currently working its way through the initial stages of the regulatory pipeline is a requirement to install cabin water spray systems in all air carrier aircraft -- an idea that the FAA's own study indicates would cost $11.6 billion. I would like to further expand on this proposal because I think it highlights the growing tendency on the part of the government to advance questionable proposals, regardless of the cost, and regardless of the consequences.

If airlines are required to install cabin water spray systems for smoke and fire suppression in all their aircraft, the operational costs -- in terms of extra fuel consumed alone -- will be excessive. Aircraft would be required to carry between 325 and 3600 additional pounds of equipment and water for the entire duration of every trip. Even more troubling is the fact that if any cabin water spray system malfunctions, and the on-board water is sprayed or dumped into the aircraft cabin, the result is an almost assured loss of on-board control systems and the possible loss of the aircraft. Hopefully this proposal will be relegated -- sooner rather than later -- to the "bad-ideas" file at the FAA. In an industry which has removed olives and lettuce leaves to save costs, and reduced fuel burn by eliminating the weight of ash trays, the operational costs of this system amount to as many as 20 additional passengers being carried with no additional revenue; and that's after spending $11.6 billion for the system to begin with.

There is one additional area in which this Subcommittee can strike a blow for U.S. citizens as well as the U.S. airlines and our employees. Here, I am referring to the "level playing field".

Federal Government policies, particularly in the security area, work against the interest of the U.S. airline industry. And if the imposition of various requirements is truly necessary to protect U.S. citizens, the recognition must be made of the fact that 50 percent of U.S. citizens travel on non-U.S. flag airlines. Therefore, the standards put forward to protect U.S. citizens, either in the area of drug testing, alcohol testing, security, or such seemingly benign practices as collecting beverage containers during taxi, must also apply to foreign carriers. To do otherwise is to deny half of all U.S. citizens traveling internationally the protection from hazards which are provided by U.S. carriers.

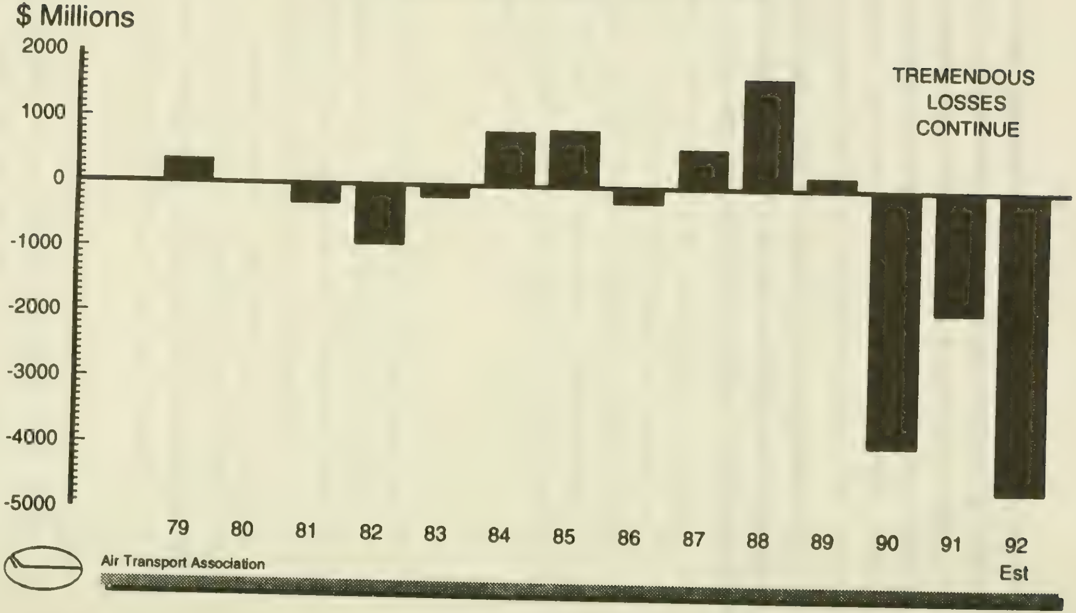
What can be done to preempt such ill advised regulatory initiatives? We would urge your consideration of withholding the appropriation of funds for DOT or FAA rule making activities unless a far more rigorous cost/benefit and economic impact analysis in support of such regulations is institutionalized by the agencies involved. Additionally, we believe parties impacted by such regulations should be afforded the opportunity to effectively protect their interests in court. Finally, we suggest you consider requiring the Executive Branch to apply the same regulatory requirements to the international operations of foreign carriers that are imposed on U.S. carriers. We will be pleased to submit appropriate language for your consideration.

Finally, on the question of overall system efficiency, you have heard from ATA many times in the past regarding our views on serious FAA reform. We remain convinced that such fundamental reform -- reform designed to change the entire culture of the FAA from one of a traditional, staid bureaucracy to one dramatically more goal and achievement oriented -- is not only possible but imperative. Reform must include provisions for consistent long-term management, a revised approach to the hiring of FAA personnel, restructured policies for procurement of major air traffic control systems, and innovative approaches to program funding. Business as usual has not worked.

As an example of what is wrong with the FAA, let me remind you of the saga of the imposition of PFC's on frequent flyer award coupons -- a battle this subcommittee fought for us last Congress. Despite the clear legislative history and repeated admonitions from members of this Committee and your Senate counterparts that such awards were not to be taxed, and despite even a separate legislative admonition trying to "wave off" an FAA intent on sticking with its misinterpretation of the law, today frequent flyers continue to be forced to pay PFCs. Granted, in the scheme of things, this is a small point -- but it well illustrates the stolid, often obstinate and out of touch behavior too typical of today's FAA. It is this behavior and attitude with which the industry must deal every day, in millions of interactions, which adds constant but immeasurable cost -- and it is this culture that must be changed. The time is right, at the beginning of the new Administration, to challenge both the Congress and industry to come up with the correct formulation to complete FAA reform once and for all.

ATTACHMENT A

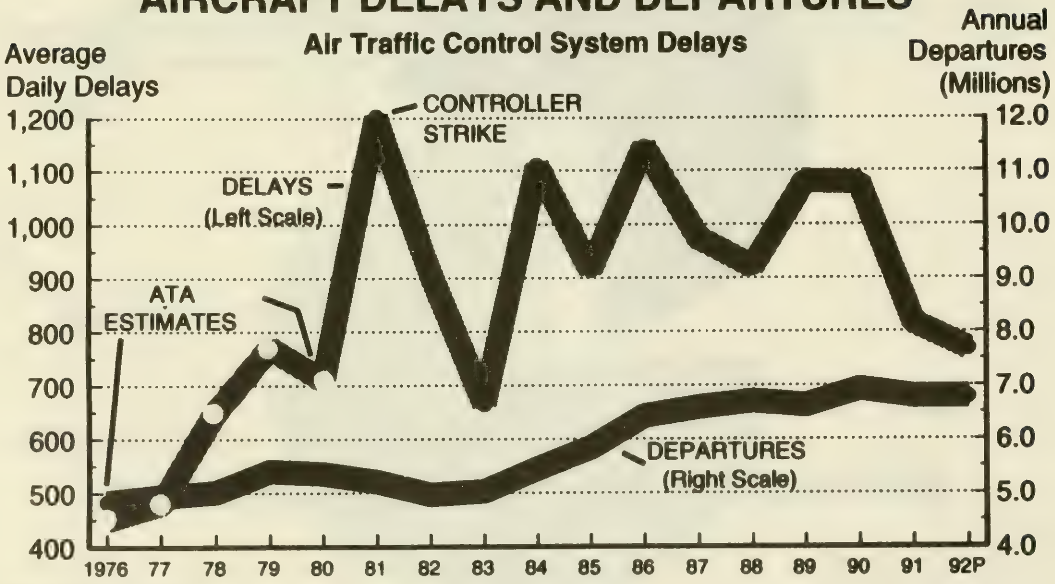
NET INCOME
U.S. Scheduled Airlines



ATTACHMENT B

AIRCRAFT DELAYS AND DEPARTURES

Air Traffic Control System Delays



Source: FAA and ATA

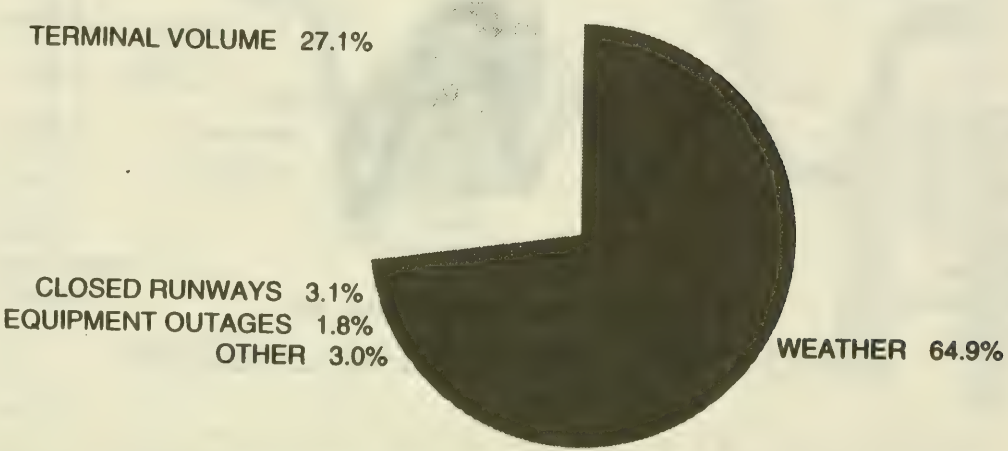
Air Transport Association

ATTACHMENT C

FAA REPORTED ATC SYSTEM DELAYS

CAUSES OF DELAYS

1992



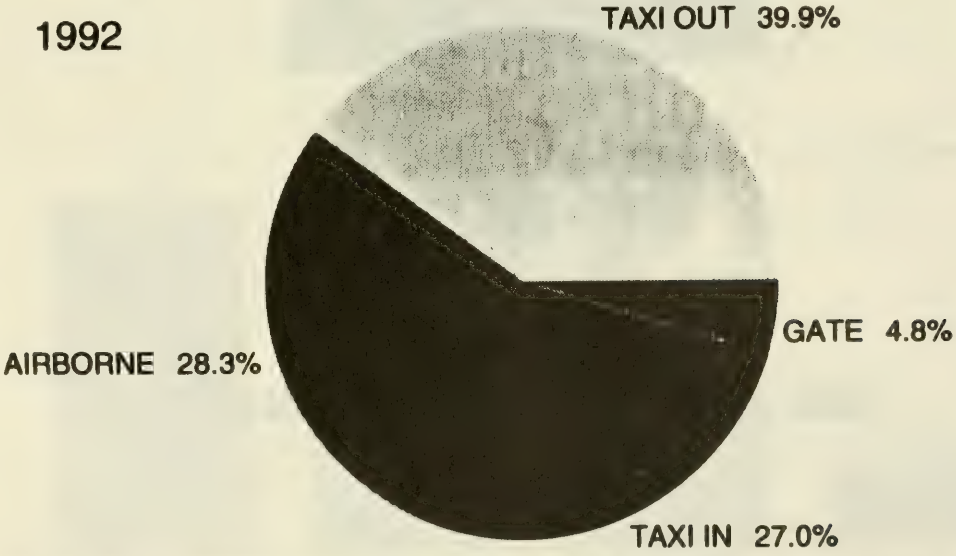
Air Transport Association

ATTACHMENT D

DISTRIBUTION OF ATC DELAY EVENTS

BY PHASE OF FLIGHT

1992



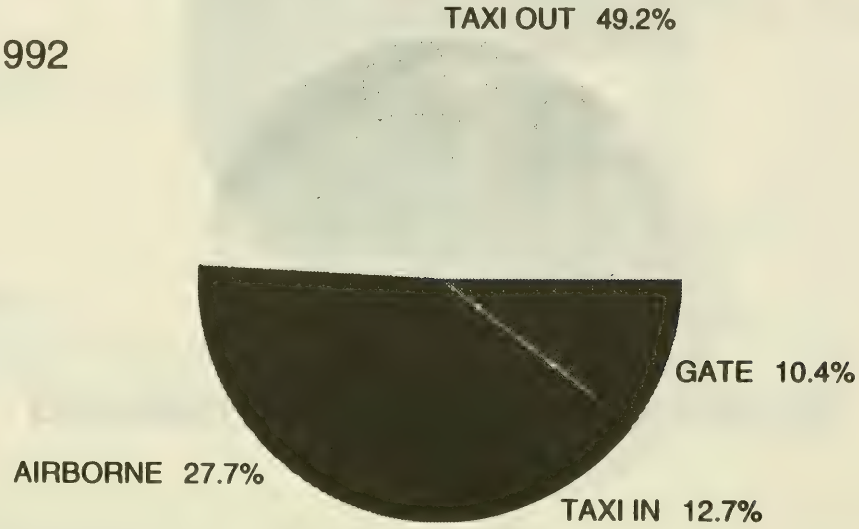
Air Transport Association

ATTACHMENT E

DISTRIBUTION OF ATC DELAY TIME

BY PHASE OF FLIGHT

1992



Air Transport Association

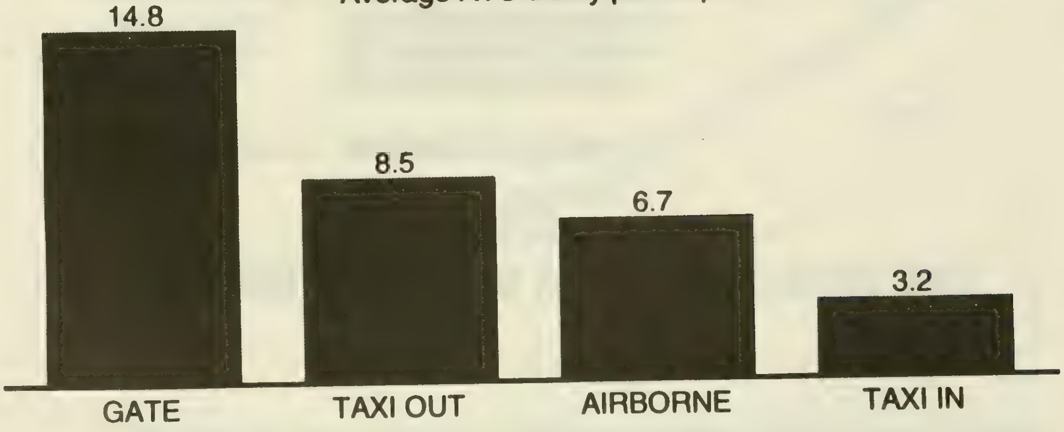
ATTACHMENT F

AVERAGE ATC DELAY TIME PER EVENT

1992

Minutes

Average ATC Delay per Departure - 6.9 Minutes



Air Transport Association

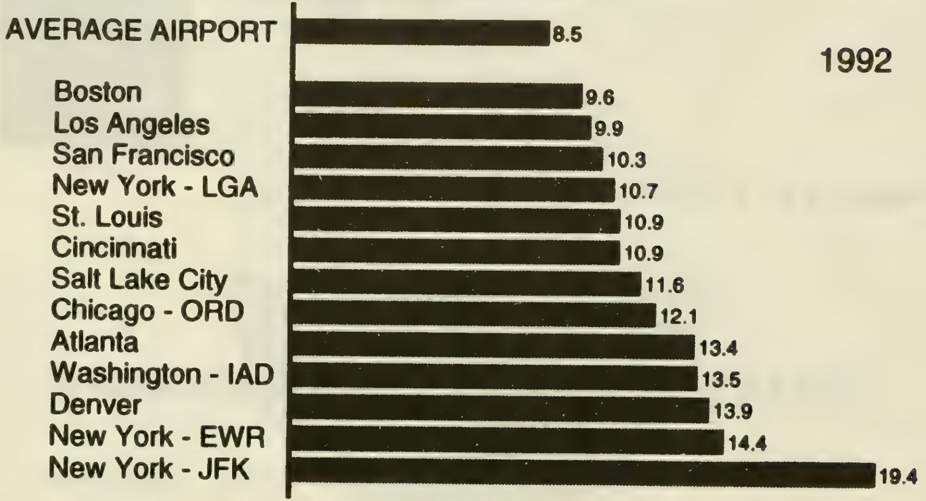
ATTACHMENT G

MAJOR AIRPORTS WITH ATC PROBLEMS

Average ATC Delay per Departure

Minutes

1992

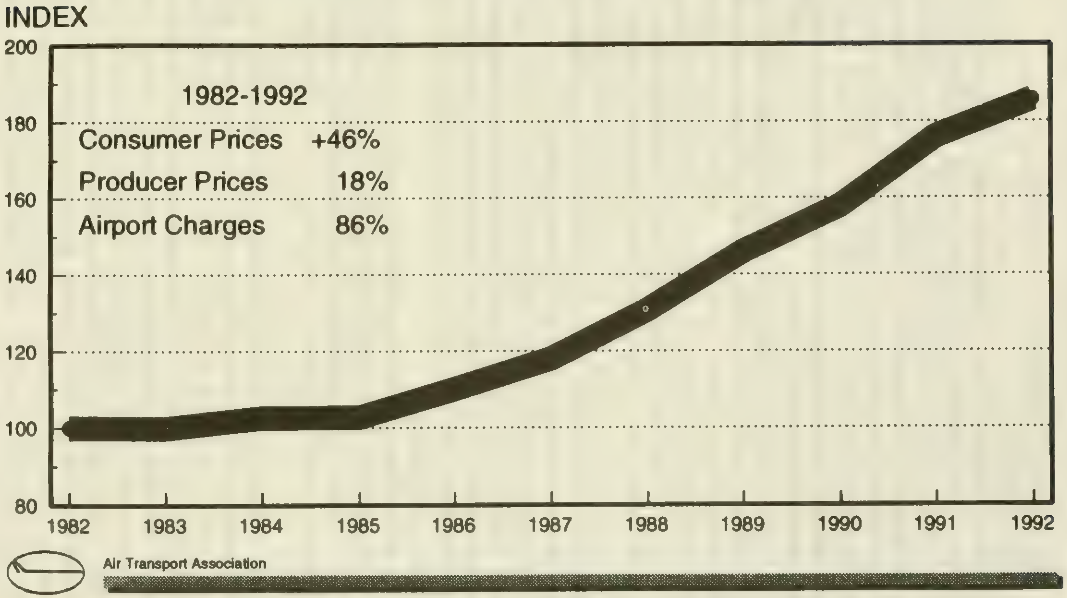


Air Transport Association

ATTACHMENT H

AIRPORT CHARGES RISING RAPIDLY

Landing Fee and Rental Costs per Passenger



Air Transport Association

STATEMENT OF MICHAEL DURHAM

Mr. CARR. Thank you very much.

Mr. Durham?

Mr. DURHAM. Mr. Chairman and Members of the Subcommittee, I am very pleased to be here today to give you our views about a very important contributor to the U.S. economy: the U.S. airline industry. Our company's chairman, Bob Crandall, considers these hearings to be extremely important and so critical that he wanted to be here himself. Unfortunately, he has had longstanding commitments for meetings in Europe with a number of our employee groups and cannot be here.

He wanted particularly to acknowledge the outstanding contribution that you, Former Chairman Lehman, and other members of the Subcommittee have made to reduce unnecessary costs and constraints on U.S. carriers. We look forward to continuing to work with you in addressing these problems in the future.

I believe that everyone here is aware of the role that aviation plays in our economy. It is the core component of a $700 billion travel and tourism industry, which is our Nation's largest industry, and a large employer in its own right.

Its recent problems have resulted in the disappearance of two carriers, myriad pay cuts, numerous service cutbacks, layoff of approximately 70,000 airline workers, and the cancellation or deferral of in excess of $12 billion worth of orders for aircraft, aircraft engines, and parts.

Any industry that has lost in excess of $10 billion in the past 3 years, as we have done, obviously has some very serious problems. The industry posted record losses in 1992, even without the special charges associated with changing accounting for retiree health benefits.

American, which is generally considered one of the industry's strongest participants, reported a loss of $935 million for the year. I am most unhappy to report that the bond rating agencies are considering lowering their assessment of our creditworthiness into the area uncomfortably close to junk bonds.

Losses of this magnitude reflect problems that are far greater than the fall off in business that is normally associated with a weak economy. While an anemic economy has certainly made things worse, were the economy to recover tomorrow, the air carrier industry unhappily would not spring from its sick bed, reinvigorated and healthy.

Although the U.S. airline industry was deregulated 15 years ago, the health of our business and the ability of the U.S. public to continue to reap the benefits the largest, lowest cost, and most efficient air transportation system in the world, are in many ways significantly affected by the actions and policies of our Government. While nominally a deregulated industry, the reality is that our operating environment is far from regulation-free. In my time with you today, I would like to touch briefly on five areas in which a change in Government policies and actions would have a beneficial impact on the industry's vitality.

Topping the list is the apparent belief of many in Government that all existing capacity must be kept aloft at any cost. Clearly, today there are too many flights too often to too many places. We have heard a lot in recent weeks as to why this is so. In fact, unfortunately, most of it is simply incorrect.

Following deregulation, U.S. carriers had two routes towards growth: either internal expansion or merger with other carriers. American grew principally from within, and frankly, we're somewhat tired of having to apologize for our success.

Since deregulation we have invested $26 billion in our company, principally in new aircraft and facilities; created more than 80,000 new jobs; and built the largest, most efficient full service airline in the United States. We did so not out of a sinister drive to eradicate our rivals, but in the belief that broad market coverage and economies of scale would maximize profitability and thus best serve our shareholders, our employees, suppliers, and the communities we serve.

I think if you were to ask the residents and businesses of Raleigh/Durham, Nashville, Miami, San Juan, Dallas/Fort Worth, or Tulsa whether our growth has been beneficial, their answer would be strongly affirmative.

Moreover, in undertaking that growth, we believe that the marketplace would be the final arbiter of a carrier's success or failure, that the marketplace—not the Government nor the legal system—would determine whether a carrier is efficient enough to survive in a competitive marketplace. In short, we believed that, as almost all other industries, the market would eliminate less efficient participants.

Obviously, we were wrong. Having been promised a deregulated marketplace, we failed to foresee a situation in which failed carriers would be artificially kept alive, thus perpetuating excess capacity to the market's needs.

Mr. Chairman, airlines that have obviously failed and are being sustained only by the life support system of the U.S. bankruptcy code are imperilling the future of the U.S. airline industry. This situation must be changed.

The second problem I wish to address this morning is that of excess user fees and taxes. In recent years, the Government has shifted more and more of the costs of the air transportation system onto its users, despite the fact that commercial aviation confers enormous economic benefits on many affiliated industries and on the economy as a whole.

Airline passengers and air cargo shippers have, in effect, become an enormous non-resident tax base. Fees imposed on airline passengers now account for fully 16 percent of the cost of an average domestic ticket, which is an increase of more than 100 percent from what it was in 1980. Similar and sizable fees are heaped on shippers.

This burden simply cannot be sustained. Legislators at all levels of government are taxing the life out of our industry. They forget that travel and tourism is the country's largest employer and thus essential to the Nation's economic health, a truth they belatedly embrace when their hometown airline looks like it might go out of business or leave their community.

We also think it is important that the President's proposed fuel tax be studied carefully and that the Administration be willing to consider adjustments which will cushion its impact on travel and tourism. I am confident that we share the desire to create new jobs and will work together to ensure that result.

Let us look now at income taxes. AMR Corporation, American's parent company, lost $280 million in 1990 and 1991. Nonetheless, because of the alternative minimum tax rules, American paid $234 million in Federal income taxes for that period. We fully understand the Congress' desire when it revised the tax code in 1986 to correct deficiencies which allowed companies reporting large profits to avoid paying any taxes. I find it hard to believe, however, that Congress intended to force companies which lose money to pay income taxes. While we are heartened by the Administration's proposed modification to the AMT rules, additional AMT relief is urgently needed.

Airlines were also I believe inadvertently caught in legislation that changed the deductibility of business meals. Pilots and flight attendants are hardly the "three martini" lunch types at whom this provision was aimed, but the $105 million per year that American pays in per diem to these employee groups are subject to the same nondeductibility rules nevertheless. We believe that airlines should be granted the same relief that crew members of commercial vessels are entitled to.

Problem area number three is unnecessary and cost-inefficient regulation, a subject we heard a little concerning just before me. Mr. Chairman, American has submitted to the Administration a long list of regulations which we believe are simply not justified on the basis of their cost/benefit analysis. Without going into them all here, I would like to touch on just one example of unnecessary regulation, and that is the supposedly temporary measure that was instituted in 1969 to fix a supposedly temporary problem: the question of take-off and landing slots at congested airports.

Here we are, 24 years after the institution of temporary regulations, and not only are slots still limiting operations at four of our Nation's most important airports, but incredibly over that entire 24-year period not one additional slot has been created. The slot system even regulates the size of the aircraft that we may operate in certain instances.

Worse yet, we are not only denied the ability to grow, in some cases we are forced to give away slots to our foreign flag competitors. That's correct. At slot-controlled airports in the United States, foreign flag carriers get whatever slots they desire, and they get them, of course, from U.S. carriers.

A fourth problem area which has also received some discussion this morning is the area of inadequate infrastructure. Unfortunately, the Government has failed to live up to its side of the deregulation bargain, which was to provide the runways and air traffic control system capacity to accommodate the explosion in growth that deregulation was calculated to create.

While this problem may be old news, unhappily, the news isn't getting any better. The President has targeted increased infrastructure spending as a way to stimulate the economy. In determining how that money gets spent, policy-makers such as yourselves should focus on the airline industry's impact on the national economy and make sure that aviation is not forgotten in the rush to build new roads and bridges.

The final problem I would like to address is international aviation, which in recent years has been the fastest growing part of our business. Unless the United States wishes to cede aviation leadership to other countries, our Government must treat international aviation as the major trade issue that it is.

Unfortunately, in the past our Government has failed to use its enormous leverage to maximize the opportunities available for U.S. carriers. International aviation is a trade opportunity which should—and we hope will—be advanced by the new Administration.

We are encouraged that among other things the Clinton Administration has focused on the fact that to create the resurgent economy it seeks, the U.S. must insist on fully equitable trade arrangements and adopt a trade attitude more akin to the commercial bent of our principal trading partners. Those sentiments are particularly welcome in aviation since the U.S. air transportation market dwarfs all others and international aviation is an industry in which all U.S. producers, honed by the trials of deregulation, can compete effectively with our international brethren.

The President has shown himself open to alternative ideas and willing to engage in debate, both of which are refreshing and encouraging. He and Secretary Peña have also gotten off to a fast start in focusing on the problems of the airline industry. We are hopeful that those efforts and hearings such as this here today will lead us to solutions that will guide the U.S. airline industry back toward stability and vitality.

Thank you, Mr. Chairman.

[The prepared statement of Michael Durham follows:]

STATEMENT OF
MICHAEL J. DURHAM
SENIOR VICE PRESIDENT AND CHIEF FINANCIAL OFFICER
AMERICAN AIRLINES, INC.
BEFORE
THE SUBCOMMITTEE ON TRANSPORTATION AND RELATED AGENCIES
WASHINGTON, D.C.
MARCH 10, 1993

MR. CHAIRMAN ... MEMBERS OF THE SUBCOMMITTEE ... I AM PLEASED TO BE HERE TODAY TO GIVE YOU OUR VIEWS ABOUT A VERY IMPORTANT CONTRIBUTOR TO THE U.S. ECONOMY -- THE AIR CARRIER INDUSTRY. AMERICAN'S CHAIRMAN, ROBERT CRANDALL, CONSIDERS THESE HEARINGS SO CRITICAL THAT HE WANTED TO BE HERE WITH YOU HIMSELF. HE REGRETS HIS ABSENCE -- HOWEVER HE IS IN EUROPE IN LONG-SCHEDULED MEETINGS WITH OUR EMPLOYEES.

HE WANTED PARTICULARLY TO ACKNOWLEDGE THE OUTSTANDING EFFORT THAT YOU -- AND FORMER CHAIRMAN LEHMAN AND THE OTHER MEMBERS OF THIS SUBCOMMITTEE -- HAVE MADE TO REDUCE UNNECESSARY COSTS AND CONSTRAINTS PLACED ON U.S. CARRIERS. WE LOOK FORWARD TO A CONTINUING RELATIONSHIP ADDRESSING THESE PROBLEMS WITH YOU IN THE FUTURE.

I THINK EVERYONE HERE IS AWARE OF THE ROLE AVIATION PLAYS IN OUR ECONOMY. IT IS THE CORE COMPONENT OF THE $700 BILLION TRAVEL & TOURISM INDUSTRY -- OUR NATION'S LARGEST -- AND A LARGE EMPLOYER IN ITS OWN RIGHT. ITS RECENT WOES HAVE RESULTED IN THE DISAPPEARANCE OF TWO ONE-TIME TRUNK CARRIERS, MYRIAD PAY CUTS, NUMEROUS SERVICE CUTBACKS, THE LAYOFF OF 70,000 AIRLINE

WORKERS, AND THE CANCELLATION OR LONG-TERM DEFERRAL OF ABOUT $12 BILLION WORTH OF ORDERS FOR AIRCRAFT AND AIRCRAFT ENGINES AND PARTS.

ANY INDUSTRY THAT HAS LOST IN EXCESS OF $10 BILLION IN THE PAST THREE YEARS -- AS WE HAVE DONE -- OBVIOUSLY HAS VERY SERIOUS PROBLEMS. THE INDUSTRY POSTED RECORD LOSSES IN 1992, EVEN WITHOUT THE SPECIAL CHARGES ASSOCIATED WITH A CHANGE IN ACCOUNTING FOR RETIREE HEALTH BENEFITS. AMERICAN, WHICH IS GENERALLY CONSIDERED ONE OF THE INDUSTRY'S STRONGEST PARTICIPANTS, REPORTED A LOSS OF $935 MILLION FOR THE YEAR -- AND, I AM MOST UNHAPPY TO REPORT, THE BOND-RATING AGENCIES ARE CONSIDERING LOWERING THEIR ASSESSMENT OF OUR CREDIT WORTHINESS TO A LEVEL UNCOMFORTABLY CLOSE TO "JUNK."

LOSSES OF THIS MAGNITUDE REFLECT PROBLEMS FAR GREATER THAN THE FALL OFF IN BUSINESS ASSOCIATED WITH A WEAK ECONOMY. WHILE AN ANEMIC ECONOMY HAS CERTAINLY MADE THINGS WORSE, WERE THE ECONOMY TO RECOVER TOMORROW, THE AIR CARRIER INDUSTRY UNHAPPILY WOULD NOT SPRING UP OFF ITS SICK BED, REINVIGORATED AND HEALTHY.

ALTHOUGH THE U.S. AIR CARRIER INDUSTRY WAS DEREGULATED 15 YEARS AGO, THE HEALTH OF OUR BUSINESS -- AND THE ABILITY OF THE U.S. PUBLIC TO CONTINUE TO REAP THE BENEFITS OF THE LARGEST, LOWEST-COST AND MOST EFFICIENT AIR TRANSPORTATION SYSTEM IN THE

WORLD -- ARE, IN MANY WAYS, SIGNIFICANTLY AFFECTED BY THE ACTIONS AND POLICIES OF OUR GOVERNMENT.

WHILE NOMINALLY A DEREGULATED INDUSTRY, THE REALITY IS THAT OUR OPERATING ENVIRONMENT IS A FAR CRY FROM REGULATION-FREE AND IN MY TIME WITH YOU TODAY, I'D LIKE TO TOUCH BRIEFLY ON FIVE AREAS IN WHICH A CHANGE IN GOVERNMENT POLICIES AND ACTIONS WOULD HAVE A MOST BENEFICIAL AFFECT ON THE INDUSTRY'S VITALITY.

TOPPING THE LIST IS THE APPARENT BELIEF OF MANY IN GOVERNMENT THAT ALL EXISTING CAPACITY MUST BE KEPT ALOFT -- AT ANY COST! CLEARLY THERE ARE TODAY TOO MANY FLIGHTS, TOO OFTEN, TO TOO MANY PLACES. WE'VE HEARD A LOT IN RECENT WEEKS ABOUT WHY THIS IS SO -- AND MOST OF IT IS SIMPLY INCORRECT.

FOLLOWING DEREGULATION, U.S. CARRIERS HAD TWO ROUTES TO GROWTH -- INTERNAL EXPANSION AND MERGER. AMERICAN GREW PRINCIPALLY FROM WITHIN AND FRANKLY, WE ARE SOMEWHAT TIRED OF APOLOGIZING FOR OUR SUCCESS. SINCE DEREGULATION, WE HAVE INVESTED $26 BILLION -- PRINCIPALLY IN NEW AIRCRAFT AND FACILITIES -- CREATED MORE THAN 80,000 NEW JOBS, AND BUILT THE LARGEST, MOST EFFICIENT FULL-SERVICE AIRLINE IN THE U.S.

WE DID SO NOT OUT OF SOME SINISTER DRIVE TO ERADICATE OUR RIVALS, BUT IN THE BELIEF THAT BROAD MARKET COVERAGE AND ECONOMIES OF SCALE WOULD MAXIMIZE PROFITABILITY -- AND THUS

BEST SERVE OUR SHAREHOLDERS, OUR EMPLOYEES, OUR SUPPLIERS AND THE COMMUNITIES WE SERVE. I THINK THAT IF YOU WERE TO ASK RESIDENTS AND BUSINESSES IN RALEIGH/DURHAM, NASHVILLE, MIAMI, SAN JUAN, DALLAS/FORT WORTH OR TULSA WHETHER THAT GROWTH HAS BEEN BENEFICIAL, THAT THE ANSWER WOULD BE STRONGLY AFFIRMATIVE.

MOREOVER, WE BELIEVED THAT THE MARKETPLACE WOULD BE THE FINAL ARBITER OF A CARRIER'S SUCCESS OR FAILURE -- THAT THE MARKETPLACE, NOT THE GOVERNMENT OR THE LEGAL SYSTEM, WOULD DETERMINE WHETHER A CARRIER IS EFFICIENT ENOUGH TO SURVIVE IN A COMPETITIVE MARKETPLACE. IN SHORT, WE BELIEVED THAT -- AS IN VIRTUALLY ALL OTHER INDUSTRIES -- THE MARKET WOULD ELIMINATE LESS EFFICIENT PARTICIPANTS.

OBVIOUSLY, WE WERE WRONG. HAVING BEEN PROMISED A DEREGULATED MARKETPLACE, WE FAILED TO FORESEE A SITUATION IN WHICH FAILED CARRIERS WOULD BE ARTIFICIALLY KEPT ALIVE -- THUS PERPETUATING CAPACITY EXCESS TO THE MARKET'S NEEDS.

MR. CHAIRMAN, AIRLINES THAT HAVE OBVIOUSLY FAILED AND ARE BEING SUSTAINED ONLY BY THE LIFE-SUPPORT SYSTEM OF THE U.S. BANKRUPTCY CODE ARE IMPERILING THE FUTURE OF ALL U.S. CARRIERS. THIS SITUATION MUST BE CHANGED.

THE SECOND PROBLEM I WANT TO ADDRESS IS THAT OF EXCESSIVE USER FEES AND TAXES. IN RECENT YEARS, THE GOVERNMENT HAS SHIFTED

MORE AND MORE OF THE COSTS OF THE AIR TRANSPORTATION SYSTEM ONTO ITS USERS, DESPITE THE FACT THAT COMMERCIAL AVIATION CONFERS ENORMOUS BENEFITS ON MANY AFFILIATED INDUSTRIES AND ON THE ENTIRE U.S. ECONOMY.

AIRLINE PASSENGERS AND AIR-CARGO SHIPPERS HAVE, IN EFFECT, BECOME AN ENORMOUS NONRESIDENT TAX BASE. FEES IMPOSED ON AIRLINE PASSENGERS NOW ACCOUNT FOR 16% OF THE COST OF AN AVERAGE DOMESTIC TICKET -- TWICE WHAT IT WAS IN 1980. SIMILAR -- AND SIZABLE -- FEES ARE HEAPED ON SHIPPERS. THIS BURDEN CANNOT BE SUSTAINED. LEGISLATORS AT ALL LEVELS OF GOVERNMENT ARE TAXING THE LIFE OUT OF OUR INDUSTRY. THEY FORGET THAT TRAVEL & TOURISM IS OUR COUNTRY'S LARGEST EMPLOYER AND THUS, ESSENTIAL TO THE NATION'S ECONOMIC HEALTH -- A TRUTH THEY BELATEDLY EMBRACE WHEN THEIR HOMETOWN AIRLINE LOOKS LIKE IT MAY GO OUT OF BUSINESS OR LEAVE THEIR TERRITORY.

WE ALSO THINK IT IMPORTANT THAT THE PRESIDENT'S PROPOSED FUEL TAX BE STUDIED VERY CAREFULLY AND THAT THE ADMINISTRATION BE WILLING TO CONSIDER ADJUSTMENTS WHICH WILL CUSHION ITS IMPACT ON THE TRAVEL & TOURISM INDUSTRY. I AM CONFIDENT THAT WE SHARE THE DESIRE TO CREATE NEW JOBS AND WILL WORK TOGETHER TO ENSURE THAT RESULT.

NOW LET'S LOOK AT INCOME TAXES: AMR CORPORATION, AMERICAN'S PARENT COMPANY, LOST $280 MILLION IN 1990 AND 1991. NONETHELESS, ALTERNATIVE MINIMUM TAX RULES REQUIRED US TO PAY $234 MILLION IN FEDERAL INCOME TAXES.

WE FULLY UNDERSTAND THE CONGRESS'S DESIRE, WHEN IT REVISED THE TAX CODE IN 1986, TO CORRECT DEFICIENCIES WHICH ALLOWED COMPANIES EARNING LARGE PROFITS TO AVOID PAYING TAXES. I FIND IT HARD TO BELIEVE, HOWEVER, THAT THE CONGRESS INTENDED TO FORCE COMPANIES WHICH LOSE MONEY TO PAY INCOME TAXES. WE ARE HEARTENED BY THE ADMINISTRATION'S PROPOSED MODIFICATION OF THE A.M.T. SYSTEM. HOWEVER ADDITIONAL A.M.T. RELIEF SHOULD BE PROVIDED BY ALLOWING AIRLINES TO USE THEIR ACCUMULATED A.M.T. CREDITS TO PAY FUTURE A.M.T. TAX LIABILITIES.

AIRLINES WERE ALSO, I BELIEVE, INADVERTENTLY CAUGHT IN THE LEGISLATION CHANGING THE DEDUCTIBILITY OF BUSINESS MEALS. PILOTS AND FLIGHT ATTENDANTS ARE HARDLY THE THREE-MARTINI LUNCH TYPES AT WHOM THIS PROVISION WAS AIMED, BUT THE $105 MILLION PER YEAR WE PAY THEM IN PER DIEMS ARE SUBJECT TO THE DEDUCTIBILITY RULE NONETHELESS. AIRLINES SHOULD BE GRANTED THE SAME RELIEF FROM REDUCED DEDUCTIBILITY OF BUSINESS MEALS AND ENTERTAINMENT EXPENSES THAT THE TAX CODE PROVIDES FOR CREW MEMBERS OF A COMMERCIAL VESSEL.

PROBLEM AREA NUMBER THREE IS UNNECESSARY, COST-INEFFICIENT REGULATION. LET ME CITE JUST TWO EXAMPLES. FIRST... THE EXTRAORDINARY INTERNATIONAL SECURITY REGULATIONS IMPOSED ON U.S. -- BUT NOT FOREIGN -- CARRIERS FLYING TO THE UNITED STATES. THESE RULES HAVE DRIVEN UP U.S. FLAG CARRIERS' COSTS AND AGGRAVATED OUR CUSTOMERS, WHILE SIMULTANEOUSLY SENDING A MESSAGE THAT THE U.S. GOVERNMENT THINKS U.S. CITIZENS ARE SAFER TRAVELING ON FOREIGN CARRIERS THAN ON OUR OWN.

THE OTHER EXAMPLE I'D LIKE TO CITE IS TAKEOFF AND LANDING SLOTS -- A SUPPOSEDLY "TEMPORARY" MEASURE INSTITUTED IN 1969 TO FIX A SUPPOSEDLY "TEMPORARY" PROBLEM. YET HERE WE ARE, 24 YEARS LATER, AND NOT ONLY ARE SLOTS STILL LIMITING OPERATIONS AT FOUR OF OUR NATION'S MOST IMPORTANT AIRPORTS -- INCREDIBLY, NOT ONE NEW SLOT HAS BEEN CREATED! THE SLOT SYSTEM EVEN REGULATES THE SIZE OF THE AIRCRAFT WE MAY OPERATE -- AND THAT, LADIES AND GENTLEMEN, IS CLEARLY INCONSISTENT WITH WHAT IS SUPPOSED TO BE A DEREGULATED ENVIRONMENT.

WORSE YET, NOT ONLY ARE WE DENIED THE ABILITY TO GROW -- IN SOME CASES WE ARE FORCED TO GIVE AWAY SLOTS TO ACCOMMODATE OUR FOREIGN-FLAG COMPETITORS. YOU HEARD ME CORRECTLY. AT SLOT-CONTROLLED AIRPORTS IN THE U.S., FOREIGN-FLAG CARRIERS GET WHATEVER SLOTS THEY DESIRE. AND WHERE DO THEY GET THEM? FROM U.S. CARRIERS.

MR. CHAIRMAN, AMERICAN AIRLINES HAS SUBMITTED TO THE ADMINISTRATION A LIST OF REGULATIONS WHOSE COSTS GREATLY OUTWEIGH THEIR BENEFITS. WE RESPECTFULLY RECOMMEND THAT THIS SUBCOMMITTEE REVIEW THIS LIST AND REACH ITS OWN CONCLUSIONS.

THE FOURTH PROBLEM AREA IS INADEQUATE INFRASTRUCTURE. UNFORTUNATELY, THE GOVERNMENT HAS FAILED TO LIVE UP TO ITS END OF THE DEREGULATION BARGAIN, WHICH WAS TO PROVIDE THE RUNWAYS AND AIR TRAFFIC CONTROL CAPACITY TO ACCOMMODATE THE EXPLOSION IN AIR TRAVEL THAT DEREGULATION WAS CALCULATED TO SET OFF.

WHILE THIS PROBLEM MAY BE "OLD NEWS," UNHAPPILY, THE NEWS ISN'T GETTING ANY BETTER. JUST LAST WEEK THE F.A.A. ANNOUNCED A FURTHER 14-MONTH DELAY, AS WELL AS MAJOR MANAGEMENT CHANGES, IN THE MUCH-VAUNTED -- BUT MUCH-TROUBLED -- NATIONAL AIR SPACE PLAN. THE MASSIVE MODERNIZATION PROGRAM FOR OUR AIR TRAFFIC CONTROL SYSTEM IS NOW EVEN MORE WOEFULLY BEHIND SCHEDULE AND WHO KNOWS HOW MANY BILLIONS OF DOLLARS OVER BUDGET!

PRESIDENT CLINTON HAS TARGETED INCREASED INFRASTRUCTURE SPENDING AS A WAY TO STIMULATE THE ECONOMY. IN DETERMINING HOW THAT MONEY GETS SPENT, POLICY MAKERS SHOULD FOCUS ON THE AIRLINE INDUSTRY'S IMPACT ON THE NATIONAL ECONOMY -- AND MAKE SURE THAT AVIATION DOESN'T GET FORGOTTEN IN THE RUSH TO BUILD NEW ROADS AND BRIDGES.

THE FINAL PROBLEM I WOULD LIKE TO ADDRESS IS INTERNATIONAL AVIATION WHICH, IN RECENT YEARS, HAS BEEN THE FASTEST GROWING PART OF OUR BUSINESS. UNLESS THE U.S. WISHES TO CEDE AVIATION LEADERSHIP TO OTHERS, OUR GOVERNMENT MUST TREAT INTERNATIONAL AVIATION AS THE MAJOR TRADE ISSUE IT IS. UNFORTUNATELY, OUR GOVERNMENT HAS THUS FAR FAILED TO USE ITS ENORMOUS LEVERAGE TO MAXIMIZE THE OPPORTUNITIES AVAILABLE TO U.S. CARRIERS. INTERNATIONAL AVIATION IS A TRADE OPPORTUNITY WHICH SHOULD -- AND, WE HOPE, WILL -- BE ADVANCED BY THE NEW ADMINISTRATION.

WE HAVE -- IN BRITISH AIRWAYS' PROPOSAL TO IMPLEMENT CODE SHARING WITH USAir AND ACQUIRE CREEPING CONTROL OF THAT CARRIER -- A READY-MADE OPPORTUNITY TO BEGIN THAT PROCESS. FORMER TRANSPORTATION SECRETARY CARD CHARACTERIZED OUR AVIATION BILATERAL AGREEMENT WITH THE UNITED KINGDOM AS "THE ANTITHESIS OF OPEN SKIES," AND PRESIDENT CLINTON HAS SAID HE DOESN'T THINK IT'S A VERY GOOD DEAL.

WE CAN ONLY REITERATE WHAT WE HAVE SAID BEFORE: WE THINK THAT NO U.K. CARRIER SHOULD BE GRANTED ANY RIGHTS AT ALL UNTIL THE BILATERAL AGREEMENT IS REVISED TO GIVE EQUAL OPPORTUNITY TO ALL COMERS -- AND IF RENUNCIATION OF THAT PACT IS WHAT IS NEEDED TO GET WHITEHALL'S ATTENTION, THEN WE SHOULD RENOUNCE IT! OUR BRITISH COLLEAGUES CERTAINLY HAD NO COMPUNCTION ABOUT RENOUNCING THE BERMUDA AGREEMENT IN 1976 WHEN IT NO LONGER SUITED THEM. WHY SHOULD WE BE ANY MORE RETICENT?

HAVING SAID ALL THAT, WE ARE ENCOURAGED BY PRESIDENT CLINTON'S OVERALL ECONOMIC PLAN AND THE ADMINISTRATION'S AWARENESS THAT REVISED INTERNATIONAL TRADE POLICIES GENERALLY -- AND A NEW INTERNATIONAL AVIATION TRADE POLICY SPECIFICALLY -- CAN FACILITATE ITS PROGRESS.

AMONG OTHER THINGS, THE CLINTON ADMINISTRATION HAS FOCUSED ON THE FACT THAT TO CREATE THE RESURGENT ECONOMY IT SEEKS, THE U.S. MUST INSIST ON FULLY EQUITABLE TRADE ARRANGEMENTS -- AND ADOPT A TRADE ATTITUDE MORE AKIN TO THE COMMERCIAL BENT OF OUR TRADING PARTNERS. THOSE SENTIMENTS ARE PARTICULARLY WELCOME IN AVIATION, SINCE THE U.S. AIR-TRANSPORTATION MARKET DWARFS ALL OTHERS AND INTERNATIONAL AVIATION IS AN INDUSTRY IN WHICH U.S. PRODUCERS -- HONED BY THE TRIALS OF DEREGULATION -- CAN COMPETE EFFECTIVELY WITH ALL COMERS.

THE PRESIDENT HAS SHOWN HIMSELF OPEN TO ALTERNATIVE IDEAS AND WILLING TO ENGAGE IN DEBATE -- BOTH OF WHICH ARE REFRESHING AND ENCOURAGING. HE AND SECRETARY PENA HAVE ALSO GOTTEN OFF TO A FAST START FOCUSING ON THE PROBLEMS OF THE AIRLINE INDUSTRY. WE ARE HOPEFUL THAT THOSE EFFORTS -- AND HEARINGS SUCH AS YOURS TODAY -- WILL LEAD US TO SOLUTIONS THAT WILL GUIDE THE U.S. AIR CARRIER INDUSTRY BACK TOWARD STABILITY AND VITALITY.

# #

STATEMENT OF ELLIOTT SEIDEN

Mr. CARR. Thank you, Mr. Durham.

Mr. Seiden?

Mr. SEIDEN. Thank you, Mr. Chairman. Good morning.

John Dasburg, our president and CEO, had been invited to be here and had intended to be here. He is very sorry that he couldn't. A matter of some urgency called him away. He asked me to sit in and be a pinch hitter for him today. I promised him that I would do my best, so here I am.

Rather than read my statement, Mr. Chairman, the Committee has it and I would ask that it be included in the record.

Mr. CARR. Without objection, your prepared statement will appear in the record.

Mr. SEIDEN. Thank you. I appreciate that.

If you read our statement, you might wonder whether we were confused about which Committee we were before. I wish to assure you that we know which Committee we are before, but we are trying to stay very focused. We believe that there is one issue, and one issue only, that is of overriding importance which, if it were addressed and solved in a satisfactory manner, would provide dramatic, immediate, and tangible benefits to the airline industry. It would enable us to clean up our balance sheets. It would enable us to steady ourselves in this time of real financial distress. It would enable us to get back into the business of improving our fleets and serving our communities and our customers and keeping our employees employed.

That is why at Northwest Airlines we are staying very focused. We are asking the Congress and the Administration to focus on one issue of overriding importance to our industry, and that is the impact of the Federal transportation excise taxes on the financial health of this industry.

That is not to say that I disagree with anything Mr. Merlis has said this morning, or even some of what American Airlines has said, but we think it is very important. We think the most important issue to stay focused on is the excise tax.

Let me just give you some start numbers that really jumped out at us when we pulled together our testimony.

In the last 3 years, Northwest Airlines has lost $1.68 billion. In that same 3-year period we have paid in Federal transportation excise taxes $1.04 billion. Last year, Northwest Airlines suffered an after-tax operating loss of $405 million and in that year alone we paid $391 million to the Federal Government in the form of Federal transportation excise taxes.

We believe that that kind of a situation is fundamentally inconsistent with our national tax policy, which has as its fundamental tenet that the Federal Government taxes people who can afford to pay. The Federal Government taxes people who have some income that can be taxed. The excise taxes work differently than that. We pay those taxes regardless of our income. In fact, we haven't had much of that for a long time. And we pay those taxes regardless of whether we can afford to pay them. We clearly cannot and we need relief.

We have two proposals that we wish to make to this committee, that we are making to the Congress, and that we would like to make to the Administration. One is that the excise tax be suspended in its entirety for one year. Secondly, as part of that, that the excise tax, when it is restored, be restored at a lower level and not at the present 10 percent level.

We also certainly don't believe that we can absorb any additional taxes. We can't absorb a Btu tax. It is not a matter of whining, complaining, or not being prepared to do our share, it is simply a matter of stating the facts. We simply can't afford to pay it.

The other part of our proposal—which we think has particular appeal because we think that a very strong case can and should be made that it is budget neutral over the medium and long-term—is that airlines be allowed to use their accumulated net operating losses as an offset against their excise tax liability.

Under the present tax regime, which is applicable to all companies in American industry, if a company suffers a loss in one year, and then earns profits in subsequent years, to the extent it wasn't able to offset those accumulated net operating losses by going back and refiling tax returns in previous years, it can carry those NOLs forward for up to 15 years and use those NOLs to offset income tax liability in future years.

That is a fundamental pat of the tax code. The problem with the airlines is that we continue to pay excise taxes and the two parts of the tax regime in the Federal Government don't blend. The people who monitor or administer the excise tax system don't talk to the people who administer the income tax system.

So here we are with a very large amount of accumulated NOLs, which really belong to us. They don't belong to the Federal Government or the American people. They belong to the company that lost them. In effect, we have them in an NOL bank and we are waiting to get our hands on that accumulated value in the NOL bank. We can't get it because we can't get it until we experience profits that we could use as offsets to the accumulated NOLs.

We are saying, let us take the NOLs that belong to us and let us use them as an offset now against the excise tax when we need it. We need the access to that benefit now, but we don't need it nearly as much later when we're earning profits, when we will use it as an offset under the present regime.

It is tax neutral because over the long-term the offsets would be imposed on the economy dollar-for-dollar one way or the other. It actually could be budget positive because to the extent that allowing airlines to get their hands on NOLs now at an early stage when we need them—to the extent it allows the airlines to stay in business, to replenish their balance sheets, to maintain employment—that avoids all the negative impacts on the economy of companies having to lay people off and putting them on the unemployment rolls and on welfare.

Mr. Chairman, that concludes my oral presentation. Again, we are trying to stay as focused as we can in talking about one issue that would make a difference. We commend you for the leadership you have shown over the years in air transportation matters and we are confident that if you take this up as an issue of importance to you that maybe we can move this forward.

Thank you very much.

[The prepared statement of Elliott Seiden follows:]

TESTIMONY
OF
NORTHWEST AIRLINES

Before The

Committee on Appropriations
Subcommittee on Transportation
United States House of Representatives
Washington, D.C.

On

The Financial Condition of the Airline Industry

March 10, 1993

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Good morning, Mr. Chairman and Members of the Subcommittee. I am Elliott Seiden, Vice President, Law and Government Affairs, of Northwest Airlines. I appreciate the opportunity to testify today.

These hearings could not have come at a more important time in the history of our industry and in the history of the nation. Only a few weeks ago, President Clinton announced a bold set of initiatives to restore our country's fundamental economic health. The President has called for shared sacrifice for the common good. As the President has noted, a fundamental premise of shared sacrifice is fairness -- each of us must be willing to give according to our ability.

Very frankly, Mr. Chairman, after three years of the worst financial battering ever to plague any U.S. industry, the airline industry's ability to give is exhausted. Our potential to give and contribute to the economic rebirth of our nation in the years ahead, however, is enormous. We look forward to the day that our industry has recovered sufficiently to do this.

How quickly we are able to rebound from our current problems and realize that potential will depend to a great extent on the actions of this Congress and the Administration in the next few months. We believe that a temporary modification of government policy on taxing airline passengers and cargo would, if enacted, help place the airline industry on a sound economic footing and in a position to make the critical contribution to the nation's welfare that is expected by society from this essential industry.

We believe that there are at least two different sensible reforms of the ten percent airline ticket tax on passengers and the six and a quarter percent tax on cargo which would help the industry regain its footing.

Our first recommendation, which we proposed two weeks ago before the Aviation Subcommittee and believe is quite modest, is to permit airlines to offset their obligation to pay these taxes with accumulated net operating loss carry forwards. Our second recommendation, which would have an even greater impact, is to suspend payment of these taxes for a period of at least one year and, when restored, return them at the reduced level of five percent. Finally, under either alternative, we believe it is critical that no new taxes be imposed on our industry until it returns to profitability.

I can tell you with confidence that if significant transportation excise tax relief is enacted, you will see a dramatic improvement in the fortunes of the airline industry. We recognize that our proposals are outside the jurisdiction of this Subcommittee; however, because they are being widely discussed as potential options by those interested in helping restore the economic health of the industry, we consider it critical to present to you our views today.

The remainder of this statement discusses the logic of these proposals, and how they fit into the President's overall program for economic recovery.

President Clinton's program for economic revival calls for those who are already well-off to sacrifice more than those who are less well-off. Citizens who are down and out are not being asked to sacrifice at all. This is as it should be. We support the major elements of the President's plan. We endorse raising the corporate income tax rate; we endorse capping the deduction for corporate salaries at $1 million; we endorse eliminating the deductibility of lobbying expenses; and we endorse expanding the earned income tax credit for low income citizens.

We ask that the government recognize that the airline industry today is essentially below the poverty level. The industry has lost $10 billion in the past three years, and even the "Big Three" -- American, United, and Delta -- have not been immune. In fact, Standard and Poor's recently testified before the House Aviation Subcommittee that of the eleven U.S. airlines it grades, only one is safely investment grade. It has placed the Big Three on CreditWatch and is reviewing them for possible downgrading. Airlines simply cannot afford to make any sacrifice at this time. We cannot afford a new fuel tax, no matter what the formula, and we cannot afford to pay other federal taxes that are imposed regardless of our ability to pay.

Like others in the industry, NWA has suffered in excess of $1.68 billion in after-tax losses over the past three years (and $1.48 billion over the past five years). In spite of our losses, we have continued to pay enormous sums of excise taxes and fees to the federal treasury. We are asking for relief from this destructive and fundamentally unfair situation.

A review of NWA's recent financial results discloses the following staggering economic facts:

* Between 1990 and 1992, our domestic operating revenues rose 3.86%, but our federal transportation excise tax payments increased 42.02%.

* During this same 3 year period, our after-tax losses totalled some $1.68 billion, but we actually paid $1.04 billion in federal transportation excise taxes.

* Over the five years from 1988-92, NWA's losses were $1.48 billion, but NWA paid $1.55 billion in transportation excise taxes to the federal government.

By making our recommendations to relieve the industry of specific industry taxes, we are not seeking to avoid paying taxes generally applicable to all industries. We are willing to do our fair share. However, the transportation excise tax paid on airline tickets and cargo is a unique federal tax targeted specifically at our nation's airlines, an industry that has suffered more financial hardship in the last three years than perhaps any other industry in this country. Let me try to put this into perspective by describing our own experience at NWA. In 1992, NWA suffered an after-tax operating loss of $405.1 million. That same year, we paid in excess of $391.4 million in ticket and cargo excise taxes to the federal government. (We also paid $51.2 million that year to the federal government in other excise taxes, such as customs and immigration fees, APHIS charges, etc.) If federal tax policy in the airline industry corresponded to fundamental national tax policy, which imposes taxes only on those who do not have losses and thus can afford to pay, we would have been relieved outright of the obligation to pay all such taxes.

In 1992, Northwest also paid another $106 million to various states, cities and municipalities for such items as sale and use taxes, fuel taxes, property taxes, liquor and other miscellaneous taxes. We also paid PFCs of $14.7 million, an amount we estimate will grow to some $70 million in 1993 as these federally approved charges proliferate.

Overall, for 1992, we paid in cash approximately $583.5 million in taxes of all kinds, this in a year when we lost a total of $1.06 billion. Of course, Northwest is not alone. Other airlines have borne similar tax burdens while coping with massive 1992 losses. AMR's 1992 net loss of $935 million, UAL's $957 million net loss, and Delta's operating loss of $822 million demonstrate that even the "Big Three" are ill-equipped to shoulder these taxes. For others, such as the USAir Group, which posted a staggering $1.23 billion net loss last year, the negative impact of current taxes is still greater.

The intent of the Congress in imposing the transportation excise taxes and PFCs was to impose them on passengers, not airlines. But when economic conditions prevent us from charging enough to cover our fully allocated costs, it necessarily follows that we, not our customers, are paying these taxes.

If we could raise our fares sufficiently to cover our costs, we would do so. Our costs do not determine what our fares are, however. Customer demand dictates our fare levels, and the Persian Gulf war and the recession have dampened demand to the point that we have been unable to recover our costs for three straight years.

Federal excise taxes, and PFCs, which must be paid regardless of whether we are profitable or not, are functionally no different than any other cost we must cover. We must charge enough to cover the cost of federal excise taxes no less than the cost of our labor or fuel, but stubbornly soft consumer demand continues to prevent us from doing so.

For example, in the three years 1990-1992, we paid $1.19 billion in total federal excise taxes (including customs/immigration fees and APHIS charges). Of that $1.19 billion, $161.3 million consisted of new transportation taxes and fees imposed since 1990 -- a period when we have been gasping for our financial breath. We paid these taxes first with stockholder equity, and when that ran out, by borrowing. Federal excise taxes alone essentially have destroyed our equity base.

In the last three years, the airlines have paid into the trust fund approximately $15 billion in ticket taxes. In that same time, the trust fund on average has had a balance of more than $15 billion, of which more than $5 billion currently is uncommitted surplus. If payments into the trust fund are interrupted temporarily while airlines are permitted to offset payments with NOLs or while payment of the ticket and cargo taxes is suspended, it seems unlikely that any truly necessary project dependent on funding from the trust fund would be threatened. This is particularly true in light of the fact that local airport authorities now have access to PFC revenues and do not need to rely exclusively on trust fund revenues for construction projects. The FAA already has authorized 81 airports to collect in excess of $5.9 billion in PFCs, and an additional $5.3 billion in PFCs now is in the approval process for 67 additional airports.

Moreover, in the past two years, approximately $2 billion of the excise taxes paid by the airlines to the federal government have not even gone into the trust fund for aviation related purposes; instead, this $2 billion went into the general treasury for federal deficit reduction purposes. In effect, these payments have been treated by the Treasury similar to income taxes, but without the NOL carry forward tax policy safeguards to excuse their payment in the event of losses by the "taxpayers"; hence, our proposal to offset losses against the payments.

Clearly, we have paid far more than the government prudently has been able to spend and in circumstances when the statutory "target" of the tax, the passenger, has not in fact had to pay it. There simply is no reason to keep collecting these taxes from the nation's impoverished airlines in these circumstances.

Under the NOL proposal, allowing airlines to offset our federal transportation excise tax liability with net operating losses (NOLs) will help restore a sense of fundamental fairness to the tax system applicable to airlines. Under the income tax regime, if a company suffers a net operating loss, it presently is permitted to file for refunds of taxes previously paid, if any, in the three preceding years. If there are excess NOLs after this refiling, then the company is permitted to carry them forward in future years, to offset income tax liability in those years as well. NOLs can be carried forward for up to 15 years until they are all used up.

Airlines have this right as well, but unfortunately, they are not yet earning any income which could be offset by accumulated NOL carry-forwards on their corporate income tax returns. Instead, airlines keep piling up more NOLs as they keep losing money, and all the while they keep paying enormous sums in excise taxes and other fees to the federal treasury in the form of the airline transportation excise taxes, APHIS changes, etc. Unfortunately, the way the tax system now is set up, the NOLs thus far accumulated cannot be used to offset ticket tax liability and the corresponding cargo tax liability, only income tax liability. This is what we are asking this Congress to change.

Just as important for what NOL offsets would do for the airlines is what they would not do to the federal deficit -- they would not increase it. President Clinton is approaching deficit reduction over a five-year time horizon. In that time frame, the President has indicated a willingness to consider a short-term increase in the deficit to stimulate the economy if combined with aggressive deficit reduction actions in the following four years. Northwest's NOL offset proposal is a mirror image of the President's formula for economic recovery. While NOL offset would reduce federal tax receipts from airlines in the short term as airlines offset excise tax payments with NOL carry forwards, over the course of five years, use of NOLs to offset excise taxes would be revenue neutral and might even be revenue positive. In fact, even at 34 cents of NOL to $1.00 of excise tax, once the NOLs are used up (and we believe this would occur in one year), the transportation taxes and corporate income taxes would become payable once again thereafter.

This is because NOLs already are offsets to income tax liability in future years when companies return to profitability. Even the airlines eventually will return to profitability. The federal government receives no regular income tax from companies that have lost money in the past until all their regular NOLs are burned off. If the airlines are permitted to utilize NOLs now as offsets against the excise tax -- at a time when they desperately need the help -- the NOLs will be used up much earlier and the airlines will pay income taxes far earlier than otherwise would have occurred.

Thus, the government comes out even over the medium to long term. But by permitting the airlines to get the benefit of the NOLs earlier rather than later, the country will have preserved several airlines that otherwise would have failed. This will preserve jobs not only in the airlines, but also in their suppliers, such as airplane and parts manufacturers, and avoid unemployment and welfare expense for the employees who otherwise would have lost their jobs.

Allowing airlines to offset excise tax payments with NOLs will ensure that no carrier would be required to pay this tax until it had sufficient income. Under this idea, carriers would be able to use all NOLs to offset the excise tax, past as well as current.

Our second proposal, suspending the airline ticket tax and the cargo taxes, would have an even broader applicability, by relieving airlines of the crushing burden these taxes are imposing without regard to whether the airlines have accumulated net operating losses, or when those losses would be available for excise tax offset.

NOL offset and 12 month suspension are not mutually exclusive, but in fact are complementary. Suspension is intended to relieve all carriers for one year, on an equal basis, of the need to pay taxes they now cannot afford to pay. The intent is to give the industry a chance to catch its breath and put itself on a stronger footing; to permit the carriers to clean up their balance sheets; to restore their ability to make capital investments in the aircraft they need to modernize their fleets; and to comply with congressionally mandated noise abatement requirements.

NOL offset is designed to restore to the airline industry a fundamental principle applicable to all other industries -- the ability to recapture at least a portion of losses suffered in previous years by offsetting against tax liabilities in future years. The airline excise tax ensures that airlines keep paying taxes without relief even though they have suffered massive losses in the recent past.

These related recommendations also would, if adopted, restore a balance between the notion that users should be primarily responsible for financing the air transportation system and the notion that tax burdens should be borne only by those who can afford to pay. In times when users cannot afford to pay, accommodations must be made. We must either temper our nation's appetite for expensive airport projects, or find a non-user financed way to pay for them. We can no longer have it both ways.

If these ticket and cargo tax burdens were relieved, we would be looking forward to a break-even year in 1993 -- we might even turn a profit. We would be able to save jobs currently at risk, improve our capital expenditures and provide more funds to better serve our customers and the communities that are dependent on our air service. And our long-term future would be greatly improved. The same would be true for virtually every United States airline. It is also important, however, to reinstate the tax responsibly when the one-year suspension will have terminated. Thus, we strongly urge that after the one-year suspension, this tax be reinstated at only 5 percent, not its current 10 percent. This will prevent the creation of additional unspent surplus being accumulated again at the direct expense of the health of the airline industry, and will put the fund on a pay-as-you-go basis.

From our perspective, we are merely requesting that the liability for a tax be relieved for a temporary period because there are already sufficient funds in an account, i.e. the Aviation Trust Fund, to pay for the projects which the tax is designed to fund. However, we recognize that there are federal budget rules which must be addressed in implementing this proposal. We believe that, given the grave financial predicament facing the industry, the President and the Congress should designate this situation as an emergency allowing for consideration of these proposals without regard to their short term impact on the federal budget. We can either use the money now to preserve a competitive industry, or spend it later to pick up the pieces.

There is simply no point in collecting taxes today to build an air transportation infrastructure for tomorrow when the airlines for whom the facilities are being built are being destroyed in the process.

There are other actions the Congress could take that would help the industry. Liberalization of foreign investment rules is long overdue, and the government as a whole could show greater restraint in introducing new, expensive regulations. We believe, however, that it behooves us all to settle upon one action the federal government could take that would, without question, produce significant and immediate benefits for this suffering industry. Mr. Chairman, the proposal I have made today meets these criteria. We strongly recommend its immediate consideration and enactment by the Congress.

Thank you for giving Northwest the opportunity to be here today and share with you our thoughts. We know you care as deeply about the health of our industry as we do. I will be pleased to take any questions the Subcommittee may have.

STATEMENT OF GLEN ZANDER

Mr. CARR. Thank you, Mr. Seiden. I fully appreciate its impact on this Committee and we will get into that in the questions.

Mr. Zander?

Mr. ZANDER. Thank you, Mr. Chairman and Members of the Subcommittee.

The U.S. airline industry is in a state of crisis brought about by an inability to operate profitably since the onset of the Gulf War period in August of 1990. Severe dislocations of traffic and fuel price increases which continued through the first quarter of 1991, the follow-on effects of a world-wide economic recession, and largely unabated capacity growth of the Big Three carriers has served to depress average prices to a point where only those airlines with a narrow market niche and/or very low unit costs have been able to operate profitably.

I cite a recent article in the Manchester Guardian which quotes an airline analyst from Standard & Poors on the subject of capacity growth in the industry.

"It is fairly remarkable that it took several years of huge losses before American and the other megacarriers slowed down."

Much has been made by these megacarriers in various public utterances—including today—of the supposed evils of the airlines in chapter 11. The record needs to be set straight on this issue.

What could possibly have been the start of at least a minimal recovery for the industry in 1992 was cut short by the now infamous fare wars which started in the spring. Was this price-cutting feeding frenzy started by a chapter 11 carrier? No. None other than American Airlines initiated their so-called value pricing scheme in April 1992, decreeing that henceforth there would be four fares in each market.

Northwest, another carrier not in chapter 11, countered in May with a promotion labeled "Parents Fly Free". Such promotions were not to be tolerated in the new fare gospel according to American, who promptly plunged the industry into an abyss by reducing leisure fares 50 percent across the board valid for travel through the entire summer of 1992.

The net effect of these actions was to eliminate profitability for virtually all airlines in the traditionally profitable peak summer travel season. As airlines have reported losses in the hundreds of millions of dollars each for 1992, it is not surprising to note that value pricing has been abandoned.

We remain, however, an industry mired in problems arising principally from too many seats chasing too few passengers. The megacarriers would like to solve this problem by putting the chapter 11 airlines out of business. Reducing the airline industry to three or four megacarriers and a few niche airlines is not, in our view, the solution to this problem if vigorous competition for the benefit of the consumer is to be maintained.

American, in their recent public statements indicating plans to downsize airline operations, may now be moving to agree with this proposition.

Because of the many statements made about chapter 11, I would like to make a few comments with respect to TWA's chapter 11 case.

I believe it fair to say that we have done precisely what it was designed to do. Since filing, we have reorganized our business, cut unprofitable routes, downsized our fleet, and repositioned our product, offering the most comfortable coach and economy service in the U.S. airline industry at competitive prices. We have changed control of the airline, enabling TWA's 25,000 employees to become 45 percent shareholders when the reorganized TWA emerges from chapter 11 early this summer.

We also resolved our pension under-funding problem through a comprehensive settlement including the employees, the company, the PBGC, and the former owner, Mr. Icahn. To enable TWA to weather the economic problems of these difficult times, our employees have agreed to a 15 percent reduction in compensation, plus a reduction in future pension accrued benefits, a package that improves TWA's bottom line by $660 million over the next 3-year period.

TWA, in short, through the chapter 11 process, has transformed itself from a rated LBO casualty of the 1980s to what will be a formidable competitor for the 1990s.

What, then, for the industry? At the recent meeting at Boeing with President Clinton, one thing that all of the representatives of the industry agreed on is that there is too much capacity in the U.S. airline industry. This agreement seems to arise as to whose capacity should be reduced.

To address both the overcapacity and short-term financial problems of the industry, TWA suggests for consideration legislation that would allow airlines to retain up to all of the domestic transportation tax collections, not unlike that proposed by Northwest, for a 1-year period. However, we proposed that it be based on a formula tied to capacity reduction.

Using 1992 as an example base period, each airline's available seat miles during the 1-year moratorium period would be measured as a percentage of the base. In simple terms, the greater the percentage reduction, the greater the tax retention to be allowed.

TWA will provide to the Committee and eventually to the commission specific recommendations for legislation in this area. We believe this approach and concept provides a fair way to restore a more reasonable relationship of supply to demand while minimizing the dislocation to any one geographic area or entity. It should have, in our view, both short and long-term benefits for the industry as a whole.

Second, we strongly urge that as legislation moves forward on the proposed BTU tax that its significant and adverse impact on the price of jet fuel, which we estimate to be about 10 cents per gallon, to be examined with a view to minimizing its impact on this fragile industry.

I thank you for the opportunity to present TWA's views on the problems and potential solutions.

Thank you.

LIMITING AIP PROGRAM OBLIGATIONS

Mr. CARR. We appreciate all of you being here. We have some questions we will ask for the record in the event that I don't get to them and Mr. Wolf doesn't get to them.

I would like to ask a couple of start-off questions that each of you would want to make a short comment about.

The first one comes back to this Committee on how we can be helpful.

Do you think it would be helpful if this Committee were to—as has been suggested in the other panel—put a fairly significant limitation on AIP program obligations and direct the FAA to prioritize its AIP program using a cost/benefit analysis, probably making exceptions for safety-related improvements?

Mr. MERLIS. Would that be both discretionary and formula?

Mr. CARR. Yes.

Mr. MERLIS. If that is the case, I would suggest that that might be well worth doing for some period of time, whether it is a full fiscal year or portion of a fiscal year. To get the house in order certainly would be helpful. But if it's not done for both the discretionary and the formula, then the problem you would conceivably have is that the FAA is still spending money according to formula but restricting needed items for which the incentive is lost to come up with a solution, according to the discretionary program.

Mr. CARR. Anyone else?

Mr. SEIDEN. I think we would agree with that, Mr. Chairman. But beyond that, we would urge that some way be found to get our arms around the PFC program, too. Right now, there really isn't a needs test being applied at the FAA or at the airports in terms of what to build with PFC funds. It is causing an explosion of extraction of money from airlines, as you were so correctly observing, to build in many instances projects that we believe are not needed and not justified.

We think that you are headed in the right direction.

Mr. DURHAM. I would like to echo those sentiments. As has been touched on during the course of these hearings this morning, ultimately, the airlines are the ones that bear the costs of both the expenditures of PFC funds and AIP funds. Projects that do not have the concurrence of the majority interest at airports should in our opinion not be funded.

Mr. CARR. Mr. Zander?

Mr. ZANDER. I would echo agreement with those sentiments.

Mr. CARR. We have agreement. [Laughter.]

REPEAL OF PASSENGER FACILITY CHARGES

Mr. CARR. You sort of nudge up to my second question. If it were within your power today, would you repeal passenger facility charges (PFCs), otherwise known as airline facility charges?

Mr. MERLIS. I don't think we would suggest repealing it. I think if there is a needs test, that in effect tempers the excessive cost of the PFC program to that which is necessary.

One of the ironies about the PFC program is that projects which the carriers agree are needed seem to get financed without the

PFC. The PFC came about to finance projects upon which the carriers didn't seem to believe there was a need.

I think it is another way of doing the same thing. But as long as there is a needs test, you don't have to necessarily abolish the entire PFC.

Mr. CARR. I think you just eloquently stated the rationale for repealing them. If they needed to get done, they are financed.

Mr. MERLIS. I don't want to get in the jurisdictional problem of committees, Mr. Chairman.

Mr. CARR. We are not the Ways and Means Committee, but my bias is fairly clear. I voted against them. I argued against them. It seemed to me that if you were to attempt to pass a bill through Congress today that would have as its stated objective giving local authorities the ability to tax airlines that are losing money, the Congress would not pass such a bill.

But the package came along as passenger facility charges that seemed to be superficially a user fee, superficially something that the passenger would be forced to pay. All the premises of it just never came true. Now we are stuck with this.

I think that what we ought to do in transportation infrastructure is to take a real serious look at repealing it. It does not seem to me to be a very good idea. Like you said, needed facilities manage to get funded with airline agreements. PFCs are a way for airport authorities to fund things in spite of an airline agreement.

Maybe at least what we ought to do is beef up the provisions that require airlines' consent to the PFCs.

Mr. MERLIS. We would completely agree with that.

Mr. CARR. We hear a lot about the evils of earmarking. On the other hand, if this Committee could somehow or another instill confidence in the airline industry and the travelling public that we would earmark with wisdom and not with politics—that may be impossible—and if we were to earmark from the standpoint of economic merit as well as political support, would it be a good idea for this Committee to consider earmarking some of the funds toward areas where you might achieve cost savings?

Mr. MERLIS. Clearly, that would be a step forward, particularly under the circumstances you describe where there is an economic benefit. Anything that can direct the efforts toward the problems would have to be better than a system which does not balance those equities.

Mr. CARR. Obviously, I think you would say that it wouldn't be a good idea to earmark totally for political purposes.

Mr. MERLIS. Well, a substantial portion of the non-discretionary part if based upon that. That is a lot of money being spent not necessarily where the need is, but spent because there is a formula which Congress adopted in order to have the program go forward.

So, yes, I would agree with you.

Mr. CARR. And perhaps this Committee could try to achieve a middle ground, if earmarking were not to be considered, forcing the FAA to prioritize on the basis of certain economic criteria we would lay down only informally, perhaps that they follow in making judgments about which runways and which facilities to invest in, based on what they would do to decrease airline costs and increase efficiency.

Mr. MERLIS. If you could detach the politics, once again, from their judgments, then that would be in furtherance of your objective. But frankly, I think that some of the decisions are made based upon politics. This is a political system. Let's recognize that. And while the FAA may be part of the Civil Service system, people do make decisions based on politics. So would the criteria be distorted, or would the conclusions be distorted to meet some political goal, even with your objective in hand? That is one I cannot address but one you would have to be very mindful of.

COSTS OF SECURITY REQUIREMENTS

Mr. CARR. I am sure Mr. Wolf will bring this up, and I don't want to steal his thunder if he chooses to do so, but he brought to light some news articles just the other day. Mr. Wolf directed a question to the Inspector General regarding the personnel at the FAA who were involved in airport grants also at the same time seeking opportunities in management at particular airports.

It would seem to me to be a clear conflict of interest. But nonetheless, inside the fraternity of airport management grantee/grantor, perhaps those kinds of things could happen.

One final question and I will turn it over to Mr. Wolf.

One of the things that strikes me as an aviation consumer is the whole security aspect that you raise, Mr. Durham.

What do the security requirements of the FAA cost the airlines? Do you have an industry figure, Mr. Merlis?

Mr. DURHAM. I think it would be hundreds of millions of dollars a year if one were to broadly define security in terms of airport access, customer screening, international security, et cetera.

Mr. CARR. Give me a conclusory statement. Has it gotten excessive?

Mr. DURHAM. In our opinion, clearly, yes.

Mr. CARR. Mr. Seiden?

Mr. SEIDEN. I don't have the numbers either, Mr. Chairman. I would be happy to try to pull that together for you. I agree with Mr. Durham's ball park. It is clearly in the hundreds of millions of dollars and we believe that it has clearly become excessive.

Mr. CARR. Mr. Zander?

Mr. ZANDER. I would agree with that.

Mr. CARR. For the industry, Mr. Merlis?

Mr. MERLIS. Clearly. I would further point out what I addressed earlier, the inequality of the way these security costs are borne. In other countries, they may be borne by the government. In this country, they are borne by the airlines. In other countries, or even for foreign carriers picking up passengers in this country, they are not borne at all. The security requirements are not applied to airlines which are flying to the United States which are not U.S. carriers, thereby creating not only a cost but also a negative revenue situation.

A sophisticated traveller who frequently travels in international markets who is more often than not the purchaser of the higher cost tickets knows that he can get on a plane with less "hassle" if he does not fly a U.S. carrier because the United States Government requires certain things of U.S. carriers that it does not require of foreign carriers.

Is he making an informed decision? I don't know the answer to that. But if we are seeking to protect U.S. citizens, then I think the requirements should be imposed far more extensively than they currently are.

Mr. CARR. It seems to me—and again, this is just a consumer's view—that the whole need for security seems to have gotten far, far in excess of what is necessary. I can relate just two examples.

We have been accustomed to going through the magnetometers and having our bags x-rayed. But lately, both at Detroit Airport and at National Airport on two recent flights I thought I was walking not through security but onto the set of Star Trek. They have all these very fancy dividers, television sets from every angle, smartly dressed attendants who are all wearing walkie-talkies, headsets, and funny things pointing at you from a variety of directions.

I kept thinking to myself that it looks nice. Maybe it has something to do with something. But also I kept thinking to myself, this is costing money. What happened to the three people who used to stand beside a banquet table and a basic magnetometer and go through the checks?

At Detroit on the south terminal, they have none of that equipment. Is security any less there than the fancy divider multiscreen media event that I have to walk through at the north terminal?

The other thing that occurred to me, though, is that it seems to me that the airlines might have said that they didn't want to pay for all that.

Mr. DURHAM. Mr. Chairman, if I could respond first, I think the expenditures you allude to are driven primarily by two realities. One is the desire on the part of the airlines to eliminate the fines and adverse publicity of the FAA and other checks of the security system to make sure that things cannot be smuggled through them. That has driven us to more expensive and more efficient kinds of x-ray magnetometer devices.

The other is an effort on the part of the marketing side of the airlines to eliminate as much as possible the hassles and the uncomfortableness of our passengers going through these security devices. There is very little that is more annoying, other than perhaps losing your bags, than having to practically undress to get through a magnetometer without it going off.

As a result, we have spent more money trying to get more accurate and more customer-friendly kinds of devices and facilities and to move the process through so that it doesn't take 20 minutes to get through.

Mr. CARR. What level of security do you think would be satisfactory at the run-of-the-mill airport, understanding that there may be airports because of being ports of entry and a variety of other things where you might want to have a higher level of security?

Mr. MERLIS. I can't address what level, but I think you have put your finger on something, and that is what we call threat assessment. I think the standard level of security that is required is in excess of the threat assessment. Now the security people in the FAA will say that there is no level of security that is not appropriate. But frankly, I don't think terrorism at Tallahassee is as much of a worry, conceivably, as terrorism at JFK. Yet in many respects, the security even on the domestic portion is similar, if not identical.

So threat assessment really becomes the key to it.

Frankly, all of these things—as we saw a couple of weeks ago with the port authority bombing—not that they had these systems around, but a terrorist interested in doing some damage, can do some damage irrespective of the systems people put into place.

Mr. CARR. So we have spent all this money and basically all we've done is raise the threshold against what you might call the casual terrorist. Is that it? We have spent huge sums of money not defeating terrorism, but raising a threshold against someone who flies off the handle at their spouse and is going to make an international incident to get back at them. Is that the idea?

Mr. MERLIS. It may well be. I think it is something we have to address very seriously. Security is an important concern of the carriers. We want to ensure that the passengers are appropriately protected and the issue gets down to the splitting of hairs. Unfortunately, when you are going from 99 percent to 100 percent, the incremental cost becomes astronomical.

Mr. CARR. Mr. Wolf?

AIRLINE INDUSTRY JOBS

Mr. WOLF. Thank you, Mr. Chairman.

I thank all the witnesses.

At the outset, I would say that safety is on the minds of all people who fly, and security is a part of that, particularly after the Pan Am situation. So I think if you asked the average American citizen if they would be willing to pay a little extra on the ticket for a safer flight, they would generally say yes. I guess it is hard, but I think most people are interested in that.

The problem is that we haven't had an aggressive enough prosecution or as effective enough prosecution. I still don't know the story with Pan Am Flight 103. What is the story? Are they going to get these people? Are they not going to get them? Are they in Syria? Are they here?

I am very sympathetic in trying to help the airline industry. These hearings have been important. How important is the airline industry? How many jobs are there both directly in the airline industry, and then the multipliers?

Mr. MERLIS. There are directly in the airline industry 535,000. There was a study done several years ago by Wilbur Smith and Associates. I think they came up with an 8 to 1 ratio of the multiplier for jobs dependent upon it, going through the entire travel and tourism industry, which is probably the largest industry in this county, to the manufacturing side and other kinds of services that are related.

Mr. WOLF. So we're talking about half a million directly in and then maybe——

Mr. MERLIS. Well, 4 million if that study is accurate.

Mr. WOLF. I believe you said it was the largest industry. Is that correct?

Mr. **Durham**. Travel and tourism is the largest employer in the United States.

Mr. **Wolf**. How many billions is that? In the State of Virginia it was 8 billion last year. What is it nationwide? Do you know?

Mr. **Durham**. It is a $700 billion annual industry.

EFFECT OF BTU TAX

Mr. **Wolf**. So what happens to the airline industry is very, very important.

Would you just say a little bit more about the BTU tax?

Mr. **Durham**. The BTU tax, as has been echoed in other testimony, would cost between 8 cents and 15 cents per gallon of jet fuel, depending upon how it is allocated by the oil companies.

Mr. **Wolf**. What would generate on a ticket price?

Mr. **Durham**. That would be about 2 percent on a ticket price and would result in something on the order of 2 million passengers less per year travelling on the U.S. domestic airline industry.

Mr. **Wolf**. Is this going to put you at a competitive disadvantage with Lufthansa or Swiss Air? How does that work? Do they have something comparable to a BTU tax?

Mr. **Durham**. All of us buy fuel at essentially the same price at the same airports.

Mr. **Wolf**. So you're really not going to be at a disadvantage with regard to them?

Mr. **Durham**. The question would be how bonded fuel for international use would be treated. That is unclear in the proposed legislation. If that were equalized, then I think we would be treated equally and they would either pay it or not pay it, depending on whether U.S. carriers paid it for international flights.

ROLLBACK OF TICKET TAX

Mr. **Wolf**. What would be the impact of the industry with the proposed rollback in the ticket tax from the current 10 percent to the 1990 levels of 8 percent?

Mr. **Seiden**. Mr. Wolf, that would probably reduce the tax by about $1 billion for the entire industry and it would produce that much of a benefit to the industry.

Mr. **Wolf**. That would cut your losses by half, basically.

Mr. **Seiden**. Yes. It would be a not insignificant improvement in the situation we have today.

Mr. **Wolf**. And with the improvement in the economy, would you then break even? The previous witness said that even if the economy improves, the airline industry is going to be in trouble.

Mr. **Seiden**. I don't know if it would be enough to break even. I guess it all depends on what assumptions you make about a rising economy. But I think, as Senator Dirksen used to say, "A billion here, a billion there, and pretty soon you're talking about real money."

NATIONAL AIRPORT RENOVATION

Mr. **Wolf**. The gentleman from ATA mentioned the gold plated National Airport terminal, and a possible explanement fee of $14.50 per passenger in the year 2000. That means, frankly—and I don't think this has really dawned on people—that means for someone who lives in Arlington, Fairfax, or Loudoun who flies out of National Airport, let's say, 10 times a year, you are actually talking about an $80 difference. Maybe one of you could comment about excessive building costs at some of the airports.

If you want to concentrate on National, that's fine. Or if you have another example, I would like to hear it.

Mr. DURHAM. National Airport actually is a very good example. The numbers quoted by ATA differ a little bit by carrier. American's estimate is that our passenger facility cost per enplaned passenger would increase by approximately 10-fold as a result of the new building versus our existing.

Mr. WOLF. From what to what?

Mr. DURHAM. It is roughly $1.50 right now. It would be about 10 times that when the terminal is entirely built and operational.

Mr. WOLF. Jim Wilding, who runs the airport authority, is a very reasonable guy and a very good person. I think he does a pretty good job. Have the airlines together gone to the airport authority or gone to the director and said——

Mr. MERLIS. We have a person who is permanently located at National who is our airport construction representative representing all the airlines. He works closely in attempting to temper and keep the costs down.

I think the fundamental problem is that the airlines signed an agreement that $793 million would be spent to renovate National Airport. I would point out that that $793 million will not increase capacity one iota because it is a slot-controlled airport. But recognizing how important the airport is, they agreed to it.

The Washington National Airport design—and that $793 million included a contingency for cost overruns.

The Washington Metropolitan Airport Authority is designing the airport to the amount, including the cost overruns. So once the construction takes place, God knows what the cost overruns will be. They are designing it including that amount in it. That is the fundamental problem that we have. At least a $125 million cost overrun is included in the design. Once you start building a terminal which will be somewhere in the $370 million range, the cost overrun could be another $10 million to $50 million. Our concern is this runaway spiral.

The irony is that MWAA has begun a consultation process on the PFC for Washington National to fund the cost overrun. They have proposed $168 million PFC to pay for the cost overrun. That would be like Congress not passing a budget resolution, appropriating funds, and then afterwards say, "Gee, we better raise taxes to pay for all the things we have just spent," instead of doing it in a more disciplined process.

That is effectively what they have done. The length of the PFC is currently 7 years, but if it is a $250 million cost overrun, then conceivably it would go another few years. So there is a discipline problem in that process. We have worked with them. We are trying to and we have made this very public now because we think the Congress is our last resort to try to impose that discipline.

Mr. WOLF. Congress doesn't have a lot of control over that airport.

The people of Arlington, who I no longer represent, have been burdened. At one time there was an "aluminum sky" policy there with excessive traffic. So there are two sides to the slot question.

But I am sympathetic with you on the cost there. I think it is important for you to point out that there really isn't a free lunch. Obviously, air travelers are going to pay.

If you ask people, Would you like to have that beautiful terminal? A lot of them would say yes. But then if you added on $10 or $12 per ticket, they would feel differently.

I think it is important for the airlines to make the case. I will be meeting with the airport authority about the National terminal. Although it isn't in my district, I was very active in the airport transfer. I think higher costs are actually a tax on my constituents. I am not too sure that my constituents understand that they will have to pay for that.

Mr. **Merlis**. We appreciate that.

Mr. **Wolf**. With regard to American, I did see this thing where American is using Sabre CRS to encourage travel agents to contact the Clinton Administration and voice opposition to the British Airways USAir deal.

Since all of the other companies pay in, I am not so sure that you're not almost asking some of the people that pay in to subsidize your lobbying efforts with regard to that issue.

I am troubled by foreign involvement. I did support the USAir/British Airways deal. I felt that had it could be used as leverage to gain reciprocal access to European skies.

Now, we are asking that American and United and Northwest and TWA be given this same opportunity abroad.

I think there have been too many lobbyists hired on both sides of this issue. I bet your fees are atrocious that you have paid for this. Do you know who is paying for it? The passenger is paying for it.

There are really too many former people who have worked in both administrations that are out lobbying on these foreign interests. It is really becoming a scandal.

Do I use the word lightly? No, I mean that it is becoming a scandal. Frankly, it is going to come back to bite the people that are paying those fees. It really will. People are really fed up with the number of high-level congressmen, Senators, Republicans and Democrats, who leave and go out and get involved in these international battles and the people pay.

I think the best approach—and I understand why American was opposed to it—would have been to grant this and then use this as leverage.

You have talked about the level playing field. One-half of Americans fly on U.S. carriers and the other half on foreign carriers. What applies to all of you that doesn't apply to a foreign carrier when they are flying somebody who lives in Cleveland that is going abroad? And how would we get to that? I think there ought to be a level playing field.

Also, how do they treat you abroad? Is it the same way there, or is it even?

Mr. **Durham**. Before I answer your question, Mr. Wolf, I think we should clarify who bore the cost of transmittal of our message urging travel agencies to lobby the Congress. That cost was borne entirely by the Saber subsidiary of AMR Corporation. It is not reflected in the costs or——

Mr. Wolf. The reason I raised it is that you didn't mention that in your statement. You glossed over this issue. Some of the other companies have had a little difficult problem having to participate in that. That's why I mentioned it. But I am not inferring that you all didn't pay for that thing.

Mr. Durham. I think our views on the subject are quite harmonious, actually. One can take different negotiating strategies. Unfortunately, the strategy that you suggested, which is to grant something in exchange for a determination to acquire something of equal value back in the future, has largely been the U.S. Government's policy and procedure in international trade negotiations since the end of World War II and they have failed. That is why we were suggesting as muciferously as we could that it was essential to use the very large and strong lever that the U.S. Government had, which was BA's desire to gain access to what is the largest single aviation market in the world—the U.S. domestic market—to force out of them what they are in fact unwilling to grant.

That is why we suggested as vociferously as we did the policy that we recommended.

In answer to your two questions about level playing fields, the issue that was touched on during the testimony this morning was the area of international security. There are a whole panoply of issues in which foreign carriers have costs or revenue advantages versus the U.S. carriers. They relate to something generically referred to as doing business rules abroad. We could sit here for many hours with each of the three of us airline executives giving you examples of that.

Mr. Wolf. Maybe you could submit that for the record so that we could compare these. Maybe you could give us a head-to-head comparison to your non-U.S. competition.

Mr. Durham. We have prepared such a document.

Mr. Wolf. Please provide for a record a comparison of your costs to those of foreign flag carriers showing examples of the unlevel playing field that exists. Please differentiate between domestic airports and foreign airports.

[The information follows:]

September 1992 **American Airlines Industry Brief**

International Aviation: Unrealized Opportunity

This paper tells a tale of missed opportunities in international aviation. The U.S., while pursuing the admirable policy objectives of open skies and optimized competition, has not consistently used its negotiating leverage to achieve those goals. Moreover, it has too often permitted foreign governments to establish and sustain positions inconsistent with U.S. objectives, to the detriment of U.S. airlines, consumers and the U.S. economy.

While U.S. carriers have been strengthening themselves in the crucible of deregulation and investing capital to position themselves to extend their reach in the global marketplace, ineffective U.S. bargaining has prevented them from achieving their full potential. It has also diminished the vigor of the U.S. economy, worsened the U.S. balance of trade and abetted aviation protectionism around the world.

British Airways' recently announced plan to establish a controlling interest in USAir gives the U.S. Government a new opportunity to use the tremendous leverage created by the intense desire of foreign flag carriers to gain greater access to the U.S. market, which represents about 50 percent of world aviation demand. It is time for the U.S. to use that leverage to remove many of the restrictions to which it has previously agreed, and to insist that genuinely equal market opportunities for U.S. carriers be a condition for approval of either the B.A.-USAir or any other transaction which would give foreign flag carriers the unique advantages B.A. seeks.

The British Airways proposal also represents a grave risk, for unless offset by the creation of equal opportunities for U.S. carriers, its consummation will create enormous advantages for the U.K. flag carrier and insuperable competitive disadvantages for U.S. airlines. The aviation rights which underlie the B.A. proposal among them unlimited U.S. codesharing rights for U.K. carriers are largely the result of concessions made in 1991 by the

U.S. and are an excellent example of how other governments have negotiated more aggressively than our own.

This paper will describe some of what has gone wrong and what can be done better. We will begin by discussing organizational and procedural steps the U.S. can take to strengthen its negotiating abilities, discuss some of the unique characteristics and peculiarities of the international aviation environment that affect bilateral relations, and conclude with a synopsis of our recent experience and present posture vis-a-vis our major aviation trading partners.

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AVIATION NEGOTIATIONS SHOULD RECEIVE INCREASED ATTENTION

Our international aviation problems stem from the fact that the U.S. has not adequately understood either the intensity of international aviation competition or the importance of assuring its carriers a level playing field. Quite simply, the U.S. Government should give aviation negotiations a much higher priority.

For many years, U.S. carriers have been recommending that the Department of State elevate the perceived importance of international aviation by appointing an Assistant Secretary of State for Civil Aviation Affairs, on the same level as the Assistant Secretary of State for Economic and Business Affairs. The primary function of this job would be to manage and conduct international aviation negotiations.

At the Department of Transportation (DOT), there is an Assistant Secretary for Policy and International Affairs who is responsible for international surface and maritime matters as well as international aviation. At DOT, as at State, there should be an Assistant Secretary whose only responsibility is international aviation.

The Department of State should also limit the practice of rotating diplomatic personnel through the aviation staff and build a career staff of professionals with solid credentials and institutional continuity to perform this very important function. While many of the foreign service officers currently acting as negotiators are capable individuals, they tend to serve only a year or two in the offices of Aviation Negotiations and Aviation Programs and Policies. As a consequence, they are not in place long enough to develop as comprehensive an understanding of the complex issues, tactics and strategies involved in international aviation negotiations as their foreign counterparts possess.

Another issue which must be resolved relates to carrier participation in negotiations. In other countries, a representative of the foreign flag carrier, which frequently is state-owned, is almost always present at the negotiating table. This arrangement enables the carrier, although technically only an observer, to play a strong consultative role in the talks.

In the U.S., things are different. Since we have many carriers, our Government has taken the position that it cannot allow carrier personnel to attend negotiations. Instead, it has designated the carriers' trade association, the Air Transport Association of America (ATA), as the industry observer. Since the intensely competitive U.S. carriers seldom agree, and since the ATA represents all carriers, it can represent no carrier effectively. This situation gives foreign flag carriers a great advantage, which should be overcome by allowing U.S. carriers to attend negotiations and requiring U.S. negotiators to consult individually with all interested airlines.

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THE U.S. IS THE WORLD'S ONLY TRULY COMPETITIVE AVIATION MARKETPLACE

There is a great irony in the fact that the existence of a competitive U.S. domestic aviation market provides unique leverage for the flag carriers of nations whose domestic airline systems are noncompetitive.

This phenomenon is well illustrated by the process of working out the division of revenues collected on interline flights. There are published rates for almost every city pair in the world which are, in most circumstances, split between participating carriers in proportion to the percentage of total mileage carried by each airline, weighted for certain cost factors. Such a division is called an industry-standard prorate.

In some cases, carriers refuse to accept industry-standard proration. For example, since foreign flag carriers flying to U.S. gateways have multiple U.S. carriers competing to carry their passengers bound for destinations within the U.S., they can — and do — sometimes seek to improve their own percentage of interline revenue at the expense of U.S. carriers. Thus, a foreign flag carrier serving a U.S. hub often finds that there are multiple U.S. airlines eager to carry its interline passengers and can require U.S. carriers to "bid" for its beyond business by offering preference to whatever U.S. carrier will accept the smallest percentage prorate.

If this phenomenon worked in reverse for a passenger traveling from the United States beyond a given European gateway, one might choose to say the benefit was reciprocal. However, because there is little or no intra-national competition beyond foreign international gateways, U.S. transoceanic carriers have no ability to negotiate for a favorable division of revenue.

... foreign flag carriers are not always willing to accommodate international interline travelers within their home countries. Iberia and Japan Airlines refuse to confirm space beyond their Madrid and Tokyo gateways until they are sure the seats U.S. carriers seek will not be needed for their own passengers.

American's experience with Iberia, Spain's state-owned carrier, is instructive. For many years before it served Spain, American provided Iberia a favorable prorate within the United States. In 1989, after starting service to Madrid, American asked for a reciprocal agreement from Iberia and its affiliates; Iberia refused. Since only Iberia-affiliated domestic carriers operate within Spain, American lacked the ability to insist. Although we withdrew our special prorate agreement with Iberia in the United States, Iberia simply replaced it with an identical agreement offered by U.S. carriers that do not serve Spain.

That situation remains in place today, with Iberia providing favorable prorates for U.S. carriers that do not serve Spain, while refusing to enter into identical agreements with U.S. carriers that do.

The issue of prorates aside, foreign flag carriers are not always willing to accommodate international interline travelers within their home countries. In Spain and Japan, for example, Iberia and Japan Air Lines (JAL) refuse to confirm space beyond their respective Madrid and Tokyo gateways for passengers traveling on U.S. carriers from the U.S. to interior Spanish and Japanese cities until they are sure the seats U.S. carriers seek will not be needed for their own passengers. They accomplish this by showing zero seat availability in U.S. CRS systems for their home-market flights that connect to U.S. carrier transoceanic services. Only when they are sure they will have unsold seats between Madrid and other Spanish cities, or between Tokyo and other Japanese cities, do the Spanish and Japanese carriers make seats available for passengers traveling from the U.S. on American and other U.S. carriers.

At international airports, U.S. flag carriers find it impossible to serve their customers either as efficiently as they do at home or as well as the local flag carrier.

As a consequence of this practice, the customers of U.S. flag carriers are frequently waitlisted for space beyond foreign gateways. This creates customer preference for the transoceanic services of foreign flag carriers and reduces the competitive effectiveness of U.S. flag carriers.

The fact that the U.S. has the world's only competitive market in aviation prevents U.S. carriers from responding in kind to foreign flag carriers. Suppose, for example, that a foreign flag carrier is obstructing sale of a U.S. CRS system in its home country by refusing to allow that system to sell its home-country seats. The U.S. CRS cannot respond by excluding the foreign flag from its system in the U.S. because that would make its system noncompetitive, and would lead U.S. travel agents to choose alternative systems.

The bottom line is that the existence of a competitive, deregulated U.S. market gives foreign flag carriers leverage which U.S. carriers cannot offset on their own. Only the U.S. Government can assure fair treatment for U.S. carriers, and it should do so.

FOREIGN COUNTRIES PROVIDE HOME AIRLINE ADVANTAGES

U.S. carriers operating abroad must deal with a host of pernicious practices we call "doing business issues." These are, in effect, non-tariff barriers to trade, designed and used by foreign governments to create home-country advantage for their airlines. "Doing business issues" include:

- **Airport Facilities.** At the typical international airport, U.S. flag carriers are the victims of various practices that make it impossible for them to serve their customers either as efficiently as they do at home or as well as the local flag carrier. These include being offered inadequate signage and too few gates and counter positions, being assigned less desirable locations than those used by the flag carrier, being prohibited to use proprietary computer systems for airport functions, and being required to purchase needed services from either the flag carrier or a designated local organization. Foreign governments consistently blame their shabby treatment of U.S. carriers on "inadequate space." *That is an argument the U.S. Government should ignore.*

  A lack of space in Zurich, or Tokyo, or Milan, is not a U.S. problem; it is a problem for the home government. Until the U.S. Government imposes equally unacceptable conditions on foreign flag carriers in the U.S., U.S. flag carriers will be hamstrung abroad.

Foreign flag carriers control large numbers of slots at their respective hubs, including virtually all the slots at the most desirable times.

- Slots — assigned takeoff and landing times — are a mechanism for controlling capacity at congested airports. All major European airports are slot-controlled, as are many Asian airports, most notably those in Japan. Foreign flag carriers control large numbers of slots at their respective hubs, including virtually all the slots at the most desirable times. Foreign governments do not award new slots for newly-negotiated route authorities, leaving the allocation of slots to committees of airline and airport representatives. Thus, U.S. carriers seeking to grow are often unable to secure slots consistent with required U.S. departure and arrival times, thus jeopardizing the competitive effectiveness of the intercontinental service offered by the U.S. participant. The situation in the United States is very different. In the U.S., only two major international airports — New York's John F. Kennedy and Chicago's O'Hare — are slot-controlled. At both those airports, the U. S. Government, acting through the Federal Aviation Administration (FAA), follows a policy of assuring that a foreign carrier seeking to initiate new service gets whatever slots it requests.

  And how does the FAA get these slots? Incredibly enough, by taking them away from U.S. airlines. Thus, U.S. carriers are competitively disadvantaged by both governments — our own and that of the country we seek to serve. No one seems to know — certainly no one is willing to say — why the U.S. Government chooses to deliberately disadvantage its own carriers in this way.

- **Airport Staffing.** In the U.S., all carriers are free to choose between contracting out passenger-handling and aircraft-servicing work or doing the work with their own employees. However, at many airports around the world, foreign governments force airlines to buy these services from either the national-flag carriers or monopoly/duopoly airport-service companies. This makes it very difficult for U.S. carriers either to establish their individual identity in foreign markets or to control the quality of the service they offer customers. Given the importance of quality control and brand identity in international markets, and having failed to persuade the U.S. Government to intercede on our behalf regarding these matters, American has filed several complaints under the International Air Transportation Fair Competitive Practices Act (IATFCPA). This law requires the DOT, acting in conjunction with the Department of State, to address promptly U.S. airlines' complaints against foreign governments, airlines and airports. If the foreign offender refuses to mend

At many airports around the world, foreign governments force airlines to buy passenger-handling and aircraft-servicing from either the national-flag carriers or monopoly/duopoly airport-service companies.

its ways, DOT has the power to take retaliatory measures. Unfortunately, DOT and State have often failed to take decisive action on U.S. carrier complaints and rarely act promptly.

UNIQUE SECURITY SYSTEMS COST U. S. AIRLINES MILLIONS MORE

The stated objective of the Aviation Security Improvement Act of 1990 is to protect the welfare of U.S. citizens traveling on commercial airlines regardless of what carrier they fly. The Act requires the FAA to ensure that the security procedures of foreign air carriers provide protection similar to that provided by U.S. air carriers serving the same airports. In practice, the FAA consistently allows foreign carriers to use less comprehensive security procedures than those required of U.S. carriers.

Compliance with the stringent security rules imposed on U.S. carriers by the U.S. Government is very costly. Worldwide, American has 860 specially trained security personnel whose annual pay and benefits total $29 million, a cost not incurred by our foreign flag competitors.

The intrusive security performed by U.S. airlines, when compared to the less stringent procedures of foreign carriers, is distasteful to most passengers, particularly the First Class and Business Class passengers coveted by all airlines. Moreover, the existence of intrusive security procedures creates the impression that terrorist activities have been disproportionately focused on U.S. airlines, which is contrary to the facts. These two phenomena have had a very adverse competitive impact on American and other U.S. carriers.

American has no objection to conducting whatever security measures are needed in any given situation. We do not understand, however, why our foreign flag competitors are allowed to play by a different set of rules. In our view, what is necessary for one is necessary for all, particularly when it comes to the safety of U.S. citizens.

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FOREIGN AIRLINES WORK AGAINST CRS SYSTEMS OF U. S. CARRIERS

The extraordinary efforts of foreign flag carriers to prevent the sale of U.S. CRS systems abroad are an important issue — because CRS has become a very big business in its own right, and because U.S. CRS products are better than those offered by foreign vendors.

The U.S. Government acknowledges that the fair-and-equal-opportunity-to-compete provisions in U.S. aviation bilateral agreements entitle U.S. CRS vendors to full market access, but has been unwilling to enforce those provisions. Moreover, because the U.S. has shown itself willing to accept prolonged and recurrent noncompliance, our foreign flag competitors have acted aggressively against U.S. systems.

SABRE Travel Information Network (STIN), a division of American Airlines, operates SABRE, the largest CRS system in the U.S. Since the mid-1980s, STIN has been seeking to penetrate the European market, where it has met determined opposition from the European airline owners of the Amadeus and Galileo CRS systems. Unfortunately, because of the structure of the European airline industry, those carriers have ample opportunities to prevent STIN from succeeding.

The U.S. Government acknowledges that the fair-and-equal-opportunity-to-compete provisions in U.S. bilateral aviation agreements entitle U.S. CRS vendors to full market access, but has been unwilling to enforce those provisions.

When U.S. airlines seek to sell their CRS systems abroad, foreign flag carriers seeking to prevent the sale can, and do, make the U.S. CRS useless to foreign travel agents simply by refusing to make their home-market schedules and inventories available for European display and sale. Since a foreign travel agency cannot be without the ability to sell and ticket local services, such tactics effectively prevent the market penetration U.S. systems seek. And since there are multiple CRS systems in the United States, a U.S. CRS cannot respond by excluding a European airline's schedule from its U.S. displays because doing so would make its CRS system noncompetitive in the U.S. marketplace.

Only the U.S. Government can solve this problem and it can do so in one of two ways:

A) It can penalize countries that do not require their domestic airlines to participate fully in all CRS systems by depriving their airlines of rights to fly to the U.S., or

B) It can compel all U.S. CRSs to deny display rights in the U.S. market to the flag carriers of any such country.

To date, the U.S. Government has been unwilling to do either and as a consequence, U.S. CRS vendors have not made progress abroad consistent with their high level of capability.

THE STATE OF KEY U.S. AVIATION BILATERAL RELATIONSHIPS

United Kingdom

Our bilateral relationship with the United Kingdom is in an unhappy state. The Bermuda Agreement, as our first bilateral with the U.K. was known — because it was negotiated in that island colony — was very restrictive. In Bermuda 2, the 1977 successor negotiated after the British renounced the original agreement, U.S. negotiators accepted extraordinarily unfavorable proposals, to the detriment of our country and its carriers. For example, the U.S. gave up most of its traffic rights beyond the U.K. It also accepted:

- onerous capacity-control regulations, which the U.K. uses to hinder U.S. carriers' attempts to compete;
- extreme limitations on the number of U.S. carriers permitted to serve the U.K. (initially, the agreement allowed only one U.S. airline per U.S. gateway city, except at New York/Newark, Los Angeles, Boston and Miami);
- a prohibition on U.S.-carrier service to Manchester, despite provisions which allow U.K. carriers to serve Manchester from every U.S. city they serve from London.

The situation worsened substantially in 1980, when the U.S. agreed to a number of provisions related to the very limited rights U.S. airlines have to Heathrow. For some reason, the U.S. Government accepted a stipulation that only TWA and Pan Am could operate to Heathrow, thus contracting away its sovereign right to decide which of its airlines should operate a given route and setting itself up to buy back its rights of designation in 1991, when it wanted to transfer U.S.-Heathrow operating rights from TWA and Pan Am to American and United.

In the 1991 discussions, to persuade the British to approve a transfer over which the U.K. should never have had any influence, much less control, the U.S. gave the British an extraordinary package of new rights, including:

- significantly expanded route rights;
- unlimited U.S. code sharing for U.K. carriers, something far more valuable than the much discussed "cabotage." In effect, this provision gave B.A. the right to sell *on-line* connections to and from any U.S. city to all of its worldwide destinations, an enormous marketing advantage; and
- the right to own up to 50 percent of new ventures with other European Community airlines to serve E.C.-U.S. routes.

And in return? The United States got nothing. In fact, American and United were subjected to even more onerous frequency restrictions at Heathrow than those previously imposed on Pan Am and TWA.

The March 1991 agreement disadvantaged U.S. carriers tremendously, relative to their U.K. competitors. The proposed B.A.-USAir transaction offers the U.S. the proverbial second chance, one we should use to rectify the present adverse tilt in the U.S.-U.K. aviation relationship.

The facility imbalance between the U.S. and the U.K. is so acute that the U.S. should condition B.A.'s continued access to first-class U.S. facilities on Britain's providing comparable facilities for U.S. carriers at Heathrow!

The U.S. simply must use the opportunity presented by the B.A.-USAir transaction to secure equal opportunities for U.S. carriers. The U.S. should insist that Britain:

- grant U.S. carriers access to London from more U.S. cities.
- give U.S. carriers as much access to Heathrow as British carriers have. Today, U.K. carriers can serve 11 U.S. cities from Heathrow, while

U.S. carriers can serve Heathrow from only eight U.S. gateways.

- allow U.S. carriers unlimited access to such secondary U.K. cities as Manchester, Birmingham and Glasgow.
- change slot-allocation procedures at Heathrow to give U.S. carriers slots at desired times, as the FAA does for foreign carriers at slot - controlled international airports in the U.S.
- grant U.S. carriers traffic rights beyond the U.K. equal to those enjoyed by U.K. carriers.
- give U.S. carriers rights to fly to the U.K. from points beyond the U.S., thus offsetting British carriers' rights to fly to the U.S. from points beyond the U.K.
- give U.S. carriers opportunities for foreign ownership and control, and code-sharing rights within and beyond the U.K., equivalent to those enjoyed by U.K. carriers.

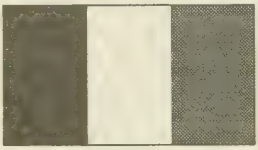
In 1991 the U.S. gave the British an extraordinary package of new rights And in return? The United States got nothing. In fact, American and United were subjected to even more onerous frequency restrictions at Heathrow than those previously imposed on predecessers

The U.S. should also insist on correcting the major facility disadvantages its carriers suffer at Heathrow, the world's most important international airport. Today, B.A. has exclusive use of a new Terminal 4 and retains exclusive use of the substantial space in Terminal 3 it used for its own operations before moving to the new facility in 1986. It uses the Terminal 3 space to handle the flights of other carriers.

Meanwhile, American and other carriers must make do with Terminal 3 facilities, inadequate by any standard and far less satisfactory than B.A.'s Terminal 4 facilities. This stands in stark contrast to B.A.'s airport arrangements in the U.S., where it has extensive, fully competitive space; at New York's John F. Kennedy International Airport it even has its own terminal.

The facility imbalance between the U.S. and the U.K. is so acute that the U.S. should condition B.A.'s continued access to first-class U.S. facilities on Britain's providing comparable facilities for U.S. carriers at Heathrow!

France



The original 1946 U.S.-France bilateral has been updated several times, sometimes through negotiation, occasionally through arbitration. Two years ago, when the French were being particularly intransigent about protecting state-owned and subsidized Air France, the United States agreed to a number of "temporary," unilateral capacity restrictions. These restrictions limit the number of U.S. airlines that can serve Paris from U.S. cities served by Air France. The U.S. Government also agreed to restrict the frequency of U.S. carrier flights between the U.S. and France through October of this year.

And in return? The U.S. got nothing.

In May 1992, in response to continuing pressure from Air France, the French government refused to approve the proposed summer schedules published by U.S. carriers, despite the fact that those schedules were consistent with both the bilateral and the 1990 agreement. Instead, the French demanded still more flight reductions. When the U.S. protested, France, on May 4, gave notice that it would terminate the bilateral, effective May 4, 1993. The denunciation occurred despite the fact that the U.S., in a last-ditch effort to avoid a break, agreed to reduce capacity by 255,000 seats more than required by the 1990 agreement. The French "price" for a new agreement? A "permanent" reduction in both the number of U.S. airlines serving France and the number of seats they offer.

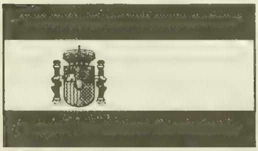
In our view, the U.S. should not accept a new agreement on anything approaching the terms proposed by the French and, for two reasons, should deny France the usual benefits of continuing service after French renunciation becomes effective. First, the U.S. should not protect state-owned Air France to the detriment of U.S. carriers. And second, the U.S. needs to send a strong signal to our other aviation trading partners that it will no longer brook unilateral change. While an interruption of air service between the U.S. and France would have adverse short-term consequences for both U.S. airlines and the U.S. public, retreating in the face of a deliberate challenge is just plain bad policy. The U.S. must make it unmistakably clear that an aviation partner that fails to live up to its obligations will jeopardize its carriers' rights to serve the U.S.

The French situation is particularly troublesome because that country's actions have been egregiously anti-competitive and anti-U.S. U.S. CRS vendors have had particular difficulties in France as a consequence of Air France's ownership of both UTA and Air Inter. Since Air Inter operates virtually all domestic service within France, U.S. vendors' CRS displays in France must have Air Inter schedules, prices and seat availability to compete effectively with the Amadeus/Esterel CRS, which is partially owned by Air France. Air Inter refuses to provide this information to SABRE, thus rendering SABRE useless to French travel agents who, not surprisingly, book lots of customers on Air Inter.

The French situation is particularly troublesome because that country's actions have been egregiously anti-competitive and anti-U.S.

Such conduct is in direct violation of paragraph 1 of the Protocol of Signature to the U.S.-France Air Transport Agreement, which guarantees "fair and equal opportunity to compete" to the carriers of both nations. American Airlines and SABRE are seeking redress against the two French carriers in a complaint filed April 27, 1992, before the Commission of the European Communities, Directorate General for Competition. Unhappily, as is almost always true with international bodies, the E.C. is moving at a glacial pace.

Spain



The U.S.-Spain aviation relationship is every bit as unsatisfactory as the relationship between the U.S. and France. The U.S. bilateral agreement with the Spanish, which dates from 1972, contains broad limitations on both the number of U.S. carriers permitted to serve Spain and the number of U.S. gateways they may use. The agreement does, however, permit the U.S. to substitute one airline for another and to designate new carriers to utilize fallow rights.

Nonetheless, in 1991, Spain refused to accept U.S. designation of American and United to fly unused U.S. authorities between Miami and Madrid and Washington and Madrid, respectively. Spain also indicated that it would not accept designation of Continental as a third U.S. airline between New York/Newark and Madrid — a new U.S. request — even *with* compensation. The U.S., for unknown reasons, responded to this Spanish intransigence by agreeing to wide-ranging discussions which resulted in granting Iberia, the heavily subsidized Spanish state-owned carrier, broad new authorities, including the unprecedented right to establish a Latin American hub in Miami.

The U.S. gave Iberia the right to exploit U.S.-Latin American markets to the detriment of the two U.S. carriers operating Latin American hubs at Miami, and got nothing in return.

Once again, the U.S. granted a foreign country additional rights to secure rights it already had — i.e., flights to Madrid from Miami and Washington, while also obtaining for Continental the right to fly between New York/Newark and Madrid. This supposedly "new" third authority was offset when Pan Am, which also flew New York-Madrid, failed and Delta, which had purchased Pan Am's international route authorities, was not permitted to replace Pan Am on this route.

Thus, the U.S. gave a foreign flag carrier the right to exploit U.S.-Latin American markets to the detriment of the two U.S. carriers operating Latin American hubs at Miami, and got nothing in return.

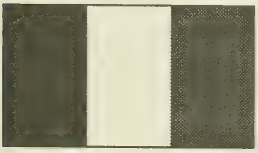
The U.S.-Spain aviation relationship is every bit as unsatisfactory as the relationship between the U.S. and France. The bilateral agreement contains broad limitations on both the number of U.S. carriers permitted to serve Spain and the number of U.S. gateways they may use.

Meanwhile, Iberia is as abusive as Air France when it comes to CRS. Iberia-affiliated carriers Aviaco and the Binters operate virtually all services within Spain and between Spain and the Canary Islands and the Mediterranean; those carriers, like Air Inter, refuse to participate at all in SABRE, thus making it impossible for SABRE to compete in Spain. Iberia's instructions to its affiliated domestic carriers to boycott SABRE are quite similar to its own efforts, in 1990, to cripple SABRE in Spain by withdrawing its own services from the system.

Iberia rejoined SABRE only after a sharp rebuke from the DOT in response to the IATFCPA complaint we filed; that was one of the few instances in which DOT clearly and unequivocally threatened an offending carrier with meaningful sanctions. Having lost that battle, Iberia determined that it could achieve the same result — excluding SABRE from Spain — by having its sister companies withdraw from SABRE. By condoning this behavior, the Spanish government, like the French, knowingly, willfully and consistently violates its bilateral air transport agreement with the U.S.

American and SABRE have filed a complaint against the Spanish with the Commission of the European Communities similar to the one we have filed against the French. The European Community has not yet acted, however, and American is once again faced with the necessity of filing an IATFCPA complaint.

Italy



In our air transport agreement with Italy, signed in 1970, the U.S. accepted very stringent limits on the number of U.S. gateway cities to be served by *any* carrier to and from Italy and agreed that only two U.S. airlines would be allowed to serve Italy.

For many years, the two designated U.S. carriers, TWA and Pan Am, chose not to serve a number of the routes authorized by the bilateral agreement. In June, 1988, because neither TWA nor Pan Am then served Chicago-Italy, a route the U.S. was entitled to serve, the U.S. designated American to provide the service.

The U.S. then set out to win the right for a third U.S. carrier to participate in U.S.-Italy service, and to persuade the Italians to allow American to use U.S. operating rights between Chicago and Italy, which it already had but which neither TWA nor Pan Am chose to use. It took the U.S. three years to break Alitalia's monopoly between Chicago and Italy. State-owned Alitalia first persuaded the Italian government to delay negotiations; then, it sought more authority for itself in exchange for American's entry. Worse yet, what the U.S. and American got is very limited. American is permitted only one daily Chicago- Italy flight, and since it uses that authority to serve Milan, cannot fly Chicago-Rome nonstop, which remains an Alitalia monopoly.

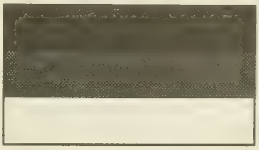
It took the U.S. three years to break Alitalia's monopoly between Chicago and Italy. State-owned Alitalia first persuaded the Italian government to delay negotiations; then, it sought more authority for itself in exchange for American's entry. Worse yet, what the U.S. and American got is very limited. American is permitted only one daily Chicago-Italy flight

Italy has done everything possible to cripple American's competitive abilities. At Milan's Malpensa Airport, all carriers are required to contract for ground services from SEA, a monopoly handling contractor which provides woefully unsatisfactory service and charges some of the highest rates in Europe. SEA refuses to allow us to use our own employees to check in and board American Airlines passengers on American Airlines flights, will not allow us to install our computerized airport-management system at the airport, and will not assign dedicated check-in desks for American's use.

Italy has done everything possible to cripple American's competitive abilities.

To rectify this situation, American has brought an IATFCPA complaint. The Italian and U.S. governments have discussed the issues and American and SEA have had several meetings on the subject. Unhappily, SEA continues to stonewall and the problem remains unresolved.

Germany



The U.S.-German aviation environment, once a model, is deteriorating rapidly. Since 1955, U.S. carriers have had broad access to German markets and U.S.-German traffic has grown accordingly. State-owned Lufthansa won the right to serve 12 U.S. cities in 1978 and has since been authorized to serve several more. Two years ago, the U.S. even proposed a true open skies agreement with Germany.

Recently, as Lufthansa's economic performance has worsened, the German government has turned away from aviation liberalism. While Lufthansa was competing against weak U.S. airlines, it did well; it thus failed to see its own need to become more efficient. Now that new, more vigorous competitors are on the scene, it has recruited the German government to help blunt their abilities.

> ***While Lufthansa was competing against weak U.S. airlines, it did well. Now that new, more vigorous competitors are on the scene, it has recruited the German government to help blunt their abilities.***

As things stand today, Germany has stated its intention to restrict the capacity U.S. carriers offer between the two countries, and to limit authority for U.S. airline flights beyond Germany. It has also signaled its intention to demand greater access to U.S. markets for Lufthansa.

> ***Germany's is clearly the most important economy in Europe. Thus, we believe the United States should make it clear to Germany that denunciation of our air transport agreement would be an unfriendly act with significant negative political consequences.***

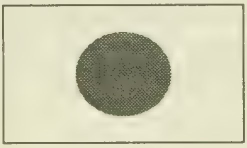
The U.S. experience with Germany is disappointing on another front as well. During the 1980s, Germany's robust economic environment spawned two new domestic carriers, German Wings and Aero Lloyd. Seeing an opportunity to compete more effectively against Lufthansa for interior German traffic, American negotiated favorable prorate agreements with both these carriers. Unfortunately, German Wings failed in 1990; last March, Lufthansa acquired Aero Lloyd and, not surprisingly, terminated the prorate agreement with American.

Germany's recent pattern of actions is inconsistent with the U.S.-Germany air transport agreement. Unfortunately, our behavior in the face of French pressure has raised questions about the U.S. commitment to making other nations live up to their obligations; thus, if we wish to preserve a liberal regime with Germany, we must make a vigorous and straightforward response to limiting initiatives.

Germany's is clearly the most important economy in Europe. Thus, we believe the United States should make it clear to Germany that denunciation of our air transport agreement would be an unfriendly act with significant negative political consequences.

Japan

Japan is of critical importance to any U.S. carrier seeking to compete in the Pacific because aircraft range limitations prohibit nonstop service between the U.S. and many destinations in the Pacific, making some intermediate "hub" essential. Given Japan's economic preeminence in Asia, Tokyo is the only city that can effectively serve as that intermediate point.



While the U.S. aviation community despairs of ever getting new authority to serve Japan, the fact is that our 1952 aviation agreement with Japan — the only agreement that exists — permits either side to designate multiple airlines. The Japanese are simply ignoring the agreement. When Washington sought to exercise its right of designation by naming United to serve Seattle-Tokyo in 1978, it waited four years for the Japanese government to accede — despite Japan's large and growing trade surplus with the U.S.

For reasons that are simply unfathomable, the U.S. Government has chosen to ignore Japan's flouting of the agreement. Since 1982, in lieu of granting rights as specified in the agreement, Japan has grudgingly consented to only three very limited grants of additional routes, each memorialized in a Memorandum of Understanding (MOU). The net effect of this procedure has been to create two classes of U.S. airlines serving Japan:

- those with substantial route and capacity rights under the 1952 agreement — Northwest and United, United having purchased in 1985 the franchise originally granted to Pan Am;
- and three others — American, Delta and Continental, known collectively as the MOU carriers — with very limited authority.

The Japanese are wont to cite airport capacity problems as the rationale for refusing to grant new route authority. While it is true that Japan's airport infrastructure is very limited, that situation is solvable and, in any case, is not a U.S. problem. The fact that U.S. carriers have neither sufficient nor appropriate access to Japan *is* a big U.S. problem — and one the U.S. should solve.

The U.S. should simply insist that the Japanese honor the 1952 agreement and failing that, should withdraw authorities now held by ANA and JAL that are inconsistent with the original agreement. Then, it should grant greater authority to Asian airlines serving the U.S. by way of hubs other than Tokyo, thus increasing the attractiveness of such hubs as alternatives to Tokyo.

The U.S. should simply insist that the Japanese honor the 1952 agreement and failing that, should withdraw authorities now held by ANA and JAL that are inconsistent with the original agreement.

Moreover, the U.S. Government should consider more carefully how it chooses the carriers to which it awards new Japanese authorities. For example, much has been made in the U.S. about "hub monopolies" and inadequate competition on international routes. It is perverse that the DOT, despite these concerns, in 1990 awarded extraordinarily valuable authority (Chicago-Tokyo) on the grounds that the awardee (United Airlines) was the only applicant with a hub capability at a foreign city (Tokyo).

What is more, U.S. interests are poorly served when our Government awards scarce routes to airlines unable or unwilling to fly them. That is precisely what occurred recently, when America West and Hawaiian Airlines were awarded Honolulu-Japan routes, which the two carriers promptly sold to Northwest, one of the two 1952 agreement carriers.

There is incontrovertible evidence that Hawaiian and Northwest were negotiating the sale of Hawaiian's new route well before the route award was finalized. Those discussions, and the subsequent sale, amount to route trafficking and make a mockery of the route-award process. One of the consequences of this behavior is that of the six new routes awarded in 1990, three are now in the hands of the already dominant duopoly (Northwest and United), despite the fact that one of the stated objectives of the route case was to create new competition. Incomprehensibly, DOT has simply ignored the Hawaiian-Northwest behavior and has approved the sale.

Japan is also particularly difficult about providing airport facilities. For example, since American began service to Tokyo's Narita Airport six years ago, it has had no success whatsoever in securing its own customer check-in space. Instead, we have been compelled to accept *ad hoc* handling arrangements with All Nippon which substantially limit our use of American Airlines employees to serve our customers. The result has been to put American, and other carriers which did not serve Narita when it opened in 1978, at a serious and continuing competitive disadvantage.

And it appears that past is prologue once again. Despite the fact that there is general agreement that serious space deficiencies will exist at Osaka's new Kansai International Airport when it opens in 1995, the Japanese have taken no remedial action — and apparently plan none.

U.S. interests are poorly served when our Government awards scarce routes to airlines unable or unwilling to fly them. America West and Hawaiian Airlines were awarded Honolulu-Japan routes which the two carriers promptly sold to Northwest. There is incontrovertible evidence that Hawaiian and Northwest were negotiating the sale of Hawaiian's new route well before the route award was finalized.

Japan is a major cargo as well as passenger market and U.S. carriers have problems on the cargo side as well. American and other airlines serving Japan are not permitted either to charter aircraft or contract for surface carriage of goods to cities they do not serve by air. No such restrictions exist for JAL in the U.S., where it holds an equity stake in DHL, a U.S. express operator. Reciprocal rights for U.S. carriers are nonexistent.

SUMMARY

More vigorous advocacy by the U.S. Government would have allowed U.S. carriers to play a larger role in international aviation, thus benefiting both U.S. carriers and the U.S. economy.

Today, we are at a crossroads. The proposed B.A.-USAir transaction and the emergence of a more protectionist Europe are challenges which cannot be ignored.

Unless it wishes to cede international aviation leadership to others, the U.S. Government must:

1) **give a substantially higher priority to international aviation matters than it has in the past;**

2) **develop a comprehensive understanding of the economic importance of aviation leadership;**

3) **develop a comprehensive understanding of how international and domestic airline competition work;**

4) **recognize that to succeed, U.S. carriers must have the same type of aggressive government support that foreign carriers enjoy;**

5) **recognize the importance of the U.S. domestic market and make full use of the negotiating leverage which access to that market represents; and**

6) **develop and implement an international aviation policy consistent with establishing U.S. international aviation leadership.**

Mr. **Wolf**. Give me one or two things right now, please.

Mr. **Durham**. For instance, in many airports in Europe, the U.S. carriers are not allowed to employ our own employees to handle our passengers, in some instances.

Mr. **Wolf**. You have to hire——

Mr. **Durham**. That's correct.

Mr. **Wolf**. Why?

Mr. **Durham**. That just happens to be the law or the rule in the particular jurisdiction that we fly into.

Mr. **Wolf**. Have you asked the State Department to back you in this?

Mr. **Durham**. We have in many, many instances, Mr. Wolf, asked the State Department to assist us in this area.

The whole area of international computer reservation systems—on which we have a current complaint before the DOT for equal treatment—versus the European CRS systems is another blatant example of a tilted playing field.

The question of international slots, which I mentioned in my testimony is perhaps the egregious of all of them where foreign carriers wishing to fly into slot-controlled in the United States simply access slots that are taken away from U.S. carriers, whereas U.S. carriers trying to obtain slots with which to fly already granted and approved authorities frequently are unable to get those slots. When they are able to get them, they are frequently not at the time of their choosing.

There is a very broad range and we would be glad to send you a copy of what we have sent to the State Department and the Department of Transportation.

Mr. **Merlis**. To use the example of de-icing, when you are at the gate at JFK in a U.S. flag airline, the same things may be done to both the U.S. flag and the foreign flag airline on your trip to England. As soon as that plane pulls away from the gate, different rules apply and the U.S. carrier— if a certain amount of time elapses, it must go through a certain procedure. The foreign carrier could sit out there for an hour before it takes off, yet half the people on the plane may be U.S. citizens.

Mr. **Wolf**. Why wouldn't FAA be able to control that? You are in the continental United States. You are Dulles Airport. It seems to me that whatever you would do for one would apply to the other.

Mr. **Merlis**. There is a series of rules along these lines. We used to call it the "killer cups" rule. They issued a rule which said that flight attendants could not pick up service products while the plane was taxiing because it was dangerous, but it only applied to U.S. carriers.

Now, either the cups are going to be dangerous to foreign passengers on a foreign airline, or they are dangerous to the U.S. We have managed to get an exemption from that, but that is the mentality of the process we go through.

Mr. **Wolf**. If we could see a breakdown of the ones that are domestic that clearly would seem—obviously, we can't force the Germans—but we could address domestic inequities. So if you could tell us that——

Mr. **Merlis**. We would be happy to do that.

Mr. SEIDEN. Congressman, one example that comes to my mind is the recently enacted Americans with Disabilities Act, the ADA. That only applies to U.S. carriers. It does not apply to foreign carriers so that the access that we provide now for our disabled passengers gets provided only on U.S. flag airplanes.

Mr. WOLF. Let me just ask two other questions on that.

Do you know of any—and let this be a bipartisan answer — high-level officials that have been in the State Department or the Department of Transportation that have been involved in these bilateral negotiations that have since left that are now operating and representing foreign carriers or foreign interests?

[Panel indicates negative response.]

Mr. WOLF. How would you have a needs test concerning the PFCs?

Mr. MERLIS. The criteria which the FAA has for AIP programs. For instance if you want to build an additional runway, you start the design of an additional runway when the existing runway reaches a certain saturation level. You are not allowed to go ahead with construction of that additional runway until such time as it reaches another level.

There is nothing of that sort with PFCs. If an airport wants to build an additional runway and proposes a PFC, it will necessitate great discipline on the part of the FAA to deny that because there is no statutory requirement.

Mr. WOLF. There are no regulations?

Mr. MERLIS. There are regulations, but the regulations effectively say that if it is AIP eligible and you want to do it you can do it. Fortunately, the FAA has been restrained, but that could change and projects could slip through just because they don't meet any set of objective criteria.

AMERICANS FLYING FOREIGN CARRIERS

Mr. WOLF. This last question is a tough question.

When I fly, I fly on an American carrier. Why do you think half of the people leaving the United States are flying with a foreign carrier? Do they give a different type of chocolate out? [Laughter.]

Mr. DURHAM. The primary determinant is price.

Mr. WOLF. But the prices are not that——

Mr. DURHAM. The other reason why passengers choose a foreign airline versus a domestic airline may be that they are not going simply to the gateway city in Europe.

Mr. WOLF. How many American citizens fly foreign that are going head-to-head?

Mr. DURHAM. I don't know.

Mr. WOLF. Have you ever done a survey as to why they flew a foreign carrier and not a U.S. carrier?

Mr. DURHAM. The answer is not different from the choice of carriers within the domestic market. The primary determinant is price.

Mr. WOLF. But you are such an important industry. You believe that and I believe this. I think most people do. That's why I asked the initial questions with regard to the number of jobs. I didn't think the multiplier was 8 to 1, but even if it is 4 to 1, it is unbelievable. From Marriott making the food to the farmer who grows the food—certainly the U.S. airlines are as good as the foreign airlines.

I think if the American people understood that maybe they were helping to put a U.S. carrier—I drive an American car solely because I feel an obligation to drive an American car. My dad drove an American car and I think I am helping somebody in Michigan, or wherever the car is being made.

I really think the American people may feel that way. I wonder if there isn't something that you could be doing to appeal to that basic sense of pride. That's a legitimate type of advertising that is taking place now. Have you ever looked at that?

Mr. DURHAM. I think you're exactly right, Mr. Wolf. Individuals typically make purchase decisions based on their immediate individual economic trade-offs and not on the basis of what is good or bad for the U.S. economy. I think it might well be effective for the industry to advertise the impact of the health of our industry on the economy at large, and to explain to prospective and existing passengers the consequences of choosing foreign carriers.

Certainly that is very prevalent coming back from the other direction. It is much more difficult to get foreign nationals to fly on a non-foreign flag carrier than it is to get U.S. consumers to fly on foreign flag carriers. I don't think that is driven by perceived quality differences. It is much more prevalent to be loyal to your national flag carriers on the other side of the ocean than it is in the United States.

Mr. WOLF. I noticed that.

I think maybe ATA should do some generic advertising, particularly if 50 percent—there must be a large number of those going head-to-head. If you are flying to Frankfurt, you can fly Lufthansa or you can fly American.

I think most Americans, given that opportunity and thinking in terms of the farmer, the food service operation, the safety and courtesy, your employees are as good—I would just as soon fly an American carrier to create those jobs in the United States.

I thank you all for your testimony.

Thank you, Mr. Chairman.

LIST OF FAA REGULATIONS THAT ARE NOT COST-EFFECTIVE

Mr. CARR. Thank you, Mr. Wolf.

Mr. Durham, you said that you had sent a list of regulations that you felt were not cost-effective to the Clinton Administration. Perhaps you could supply this Committee with that same list so that when the FAA is before us in a few weeks we might ask them about it.

Mr. DURHAM. We would be glad to do so.

[CLERK'S NOTE.—By subsequent correspondence, American Airlines advised the Committee that the list is currently being revised, and would be submitted as soon as possible.]

Mr. CARR. I generally invite all airlines to do the same thing. If there is a list that you have of regulations you think that are not very cost-effective or regulations which could be done in a more cost-effective manner, we would like to know that so when it comes time to quiz the FAA about their activities we might include those as part of our questioning.

ELIMINATION OF EXCISE TAXES

Relative to the proposal of Northwest on forgiveness or forbearance or offsets, NOLs against excise taxes, do the other airlines have an opinion about that position?

Mr. DURHAM. Reducing or eliminating the 10 percent excise tax is entirely consistent with our view that direct users and participants in the air transportation system bear a disproportionate percentage of the total cost of that system, which is not reflective of the ancillary industries that benefit from air transportation.

We would be supportive of that.

Mr. CARR. Mr. Zander?

Mr. ZANDER. We would prefer to see the transportation tax issue stand on its own and not get mixed up with the income tax and NOL issues.

Mr. DURHAM. I would agree with that also.

TICKET TAX

Mr. CARR. This is a Ways and Means issue, but also an Appropriations issue because if money is not going into the trust fund it is money that we don't appropriate. To the extent that you indicated it might be productive to reign in for the time being unnecessary airport development and maybe do a holding pattern, if you will, on whatever is in progress and proceed very cautiously with new airport development.

The concern I would have would be that we start an oscillation in the revenues which would then result, perhaps, in an oscillation of the spending. It has always been my belief that while this Committee could not assure all the transportation modes all the money they would desire in any one period of time, at least we would try to assure a predictable *flow* of investment dollars.

The receipts that are estimated for fiscal year 1993 to the trust fund total $4.5 billion. That is slightly more—by $200 million or so—than the fiscal year estimated uncommitted balance at the end of the year. So to forgive one year—or not recover for one year—would mean that the uncommitted balance would essentially drop to zero. That would put us on a very thin cushion against future contingencies, and of course we have ongoing projects that are multi-year projects that are being funded.

That is my concern about your proposal, Mr. Seiden, that it puts an oscillation into the funding mechanism which might be hard to flatten out in subsequent years. And if we did flatten it out, then this Committee, as has been the case in the past, takes the brunt of the criticism for running surpluses, whether they are caused by us or the FAA not spending the money in an orderly fashion.

So if we're to modulate the outflows from the fund, we have to look at what is coming into the fund. In fact, it has been a hard lesson to teach to people over the years, but this Committee—through no disrespect to our friends on the authorizing committee—is far less interested in what the authorized level of funding is than what is realistically attainable through the revenues. That is the practical limit on us. It isn't some politically derived number by well-intended authorization committees.

So your suggestion is really suggesting to us that if it were to be approved by the Ways and Means Committee, we would have a lower revenue figure, and then we would have to start planning accordingly here. Your proposal is that it is only temporary. Is that correct?

Mr. SEIDEN. The first part of our proposal, Mr. Chairman, is to suspend the entire tax for one year and then to restore it after the expiration of 12 months at a significantly lower level. We have included in our testimony a restoration number of 5 percent. Obviously, the idea is to get the ticket tax level lower. The 5 percent number we thought was a very rough-cut number. That seemed to be a good place to start. It may be that you have to fine-tune it up from 5 percent to get to a self-sustaining level.

Our intention was to use the uncommitted surplus of the ticket tax fund right now to stabilize the airline industry, a very significant component of the entire infrastructure of the air transportation system, and then to restore it at a lower level imposing discipline on everyone—the airlines, the airports, and on the Congress.

The NOL idea is much more modest than the other idea. It is not that they are mutually exclusive, but looking at the NOL idea by itself, our estimate right now is that there are $6 billion of accumulated NOLs in the entire airline industry. At a $6 billion level of NOLs, if you applied the 34 percent tax rate to it, that would produce about $2 billion worth of offsets in rough numbers. And that would all be used up in one year.

That is the number that would be applied to the offset against the ticket tax receipts. So it would be significantly less than the total suspension of the tax. It would be even in the sense that whatever an airline's NOL profile was—it is not increasing anyone's value and it is not decreasing it—whatever it is, that is what you have and that is what you will use to offset your income tax liability at some point.

So it cuts across in a non-discriminatory way and it would make far less of a dent in the excise tax fund.

Mr. CARR. It's a proposal worth thinking about. I only wanted to raise with you that there are some other consequences to the trust fund and how it operates. It possibly would require subsidizing more of the FAA through the general fund, the same situation that caused the penalty clause to be created a few years ago.

So there is a consequence in terms of investment dollars available. Even admitting that some of those investment dollars we could probably agree are not being wisely invested, we still can't change horses in the middle of the stream. Some of these horses we have to ride on through. AAS is one of them. We're all very, very distressed about that, but we have to see it through now.

Perhaps we could reign in some future airport development plans until the situation stabilizes, but if we don't have a little bit of surplus in that trust fund, our ability to manage cash flows in economic cycles is greatly diminished. I know we get blasted for any surplus being in the trust fund by some of the Chairmen on the other Committees, but the fact of the matter is that if we hadn't had some of those surpluses, both in the highway and in the aviation trust fund, our ability to manage the steady flow of dollars in cash flow situations would have been greatly diminished to the detriment of the industry.

I am anxious to learn more from you about your proposal and its consequences.

Mr. SEIDEN. I would suggest as a potential idea to have the Committee's financial analysts do an assessment of what a prudent amount of surplus would be, and then work from that. That is, effect a decrease in the ticket tax down to the level that after that one year of the significant decrease you would end up with a surplus that was prudent.

CONGESTION PRICING

Mr. CARR. Concerning congestion pricing, we heard some testimony and some of you were here at the time.

Do you have a short comment about congestion pricing?

Mr. DURHAM. In all due respects to the gentlemen who were testifying earlier, congestion pricing is a complete empty bag. Nothing that I can think of—nothing good would result from the implementation of what was referred to as congestion pricing.

The airlines don't schedule airplanes at certain times of the day to meet our own convenience. We do so at times of day that our passengers wish to travel. Particularly true at large hub airports where despite our efforts to the contrary there still remain only 24 hours in a day, and there is a minimum amount of time it takes to operate an aircraft in and out of the hub complex, congestion pricing is not going to affect the behavior of airlines or passengers one iota.

Although facility charges and related fees at airports are a significant cost, they are modest in comparison to the revenue differential of operating an aircraft at a time of day when a passenger actually wants to travel as opposed to a time of day when he does not want to travel. It may be $5 per pound cheaper to operate an aircraft at 10:00 in the morning when the airport is less congested than at 5:30 in the afternoon. On the other hand, if there are no passengers at 10:00 in the morning, that differential pricing is not going to induce me to change the schedule of my airplanes.

Congestion pricing has been discussed in our industry for many, many years and it has absolutely no value.

Mr. CARR. Any dissent? [Laughter.]

AIRLINE INPUT ON AIRPORT PROJECTS

Mr. CARR. The last and final comment I would make— and it is really more a plea for help in a constructive way—if we are to take a look at specific airport projects throughout America in relation to the AIP funding, we need to have some communications from the airlines about these investments.

I will give you my attitude for what it is worth.

I think that private airlines and the pubic sector—be it the Federal Government and the air traffic control system, the airport improvement program, or local units of government—are really joint venture partners in the total enterprise of aviation. Joint venture partners don't do very well if they don't talk to one another.

One of the things that we lack here is some information from airlines about developments that are going on at individual airports. We hear a lot from airport management and airport governance about what they would like to see happen. We hear very little from the airlines about what is happening at various local airports.

That which we learn we get because some of us know some of you and we get on the phone and call you up. When asked, you will tell us.

I find frequently, however, that airlines frequently are reluctant to tell us, or reluctant to tell us what they really think on the record because they are really concerned about their community relations in all these little airports. I understand those sensitivities, but our ability to help channel funds to airports where they can be wisely used and away from airport projects where it is going to add cost to your industry is impaired if we can't get some good information and solid advice from you.

So this is merely a plea that you, as airlines—and through all of you to those who are not at the table today, and I know some are in the room—that the airlines can help this situation by being a little more aggressive in coming to this Committee for help in trying to corral or rationalize projects that seem to be running amuck in various areas. The situation, for example, at Front Range is a good example. We don't always hear from the FAA first. The only way we get some solid information is if the people who are the joint venture partners out at the various ends of the system contact us.

We're going to try to do a better job in investing the American taxpayer's money. We're going to try to do it on the basis of economic performance rather than political clout. It is not going to be easy and we're not going to change overnight, but we do need your help in doing it. That may require you to rethink some of your policies and attempt to defend somebody at a particular place to get something done that makes sense for everybody.

PASSENGER FACILITY CHARGES

Mr. Carr. Mr. Merlis, ATA has been critical of some projects funded with PFCs, believing that these funds should be used to support airline needs only. The airport associations believe differently, as you might expect. They say that passengers pay ticket taxes and PFCs to develop and improve airport facilities that benefit them throughout their entire travel experience, not just the facilities that are used by airlines.

On what do you base ATA's position that taxes and PFCs should be used predominantly for facilities which support the airlines directly?

[ATA response follows:]

The airlines' fundamental concern is with the use of PFCs for non-aviation-related purposes. It is blatantly unfair to ask the airline passenger to pay for surface transportation which he will never use. Why, for example, should the airline passenger pay for a new road in Las Vegas designed primarily to allow Las Vegas citizens access to a yet-to-be-built "beltway" around the city? This project is related to the airport only in that it cuts through airport property (disrupting airport operations during construction), and only marginally improves access to the airport. This is the type of project to which the airlines object.

The carriers also object to the use of PFCs for on-airport projects which do not benefit the passengers who pay the tax. Here I am referring to the plethora of PFC projects to build cargo access taxiways, general aviation ramps, and the like. We say, let the actual user pay for what he is getting.

VALUE OF AIRPORT DEVELOPMENT PROJECTS

Mr. CARR. They also say that sometimes two competing airlines will have different views about the value of an airport development activity, depending on their competitive position, and that the airport authority has a responsibility to make an impartial decision which could not be made by the individual air carriers. Does this occur frequently?

[ATA response follows:]

On those occasions when it does arise, this situation tends to be an issue of timing or scope, not over need. Much more common, and increasingly so, is the debate between the carriers as a group and airport management over the need for a project. In these debates, the carriers are the ones speaking for the traveling public—their customers—while local airports appear to be more concerned with pork barrel politics.

Mr. CARR. I believe that ATA opposes "gold plated" airport projects. Could you give us some examples of what constitutes "gold plating"?

[ATA response follows:]

Gold plating is perhaps not the correct word, but has become a euphemism for wasteful spending. A few examples:

National Airport's new terminal, for which the airlines agreed to a 25 percent construction contingency is being designed to cost $50 million more than the budget, prior to turning the first spade of dirt. The entire modernization program to date is $125 million over budget. By the Authority's own admission, they are out to build a monument.

At JFK airport, the Port Authority spent $21 million on the construction of a baggage tunnel which sits unfinished and unused. The Port Authority also built a $56 million parking garage, which cost an average of $39,000 per space, nearly four times the industry average for such construction. That garage remains a tremendously under-used facility in the middle of the airport's circular roadway system.

New Denver Airport, will cost $2.3 billion for an airport with the same number of runways and fewer gates than the existing facility. This airport is being built over the strong objections of the carriers, who supported a less expensive solution to the delay problems in Denver—a new runway at Stapleton.

Fort Myers, Florida runway extension and construction of international terminal. We are not aware of any domestic or international air carrier interested in providing international air service to Ft. Myers. Yet, the airport was successful in convincing FAA that if they were allowed to extend their runway to 11,000 feet, such service would come to the airport. It should be noted that simply having a long runway does not guarantee such service—there are many airports with long runways that do not have scheduled international air service (Kansas City and Tucson for example). There are also conversely, many airports with 9000 foot runways that do have international air service.

Tulsa, Oklahoma has been trying to build a third parallel runway (so they can "be a hub") despite flat operational and passenger traffic trend lines. To date, the carriers have been successful in preventing the construction of this unnecessary project.

Mr. CARR. Do you think the FAA has adequate procedures to prevent gold plating?

[The information follows:]

No. The airport/airline relationship with respect to financial decisions on the airport was well balanced prior to the imposition of PFCs. Projects that were truly needed, and properly justified, did not sit on the shelf—they were funded and built. With the creation of PFCs, however, the carriers have no way of preventing unnecessary construction. And the FAA, because of the way the PFC law is written, doesn't have a way to say no, either. Looking at the toughest cases (for example, the Tulsa runway, and proposed subway links in New York), the FAA did not make a yes-or-no decision on these proposals—they convinced the airport operator to withdraw the project for resubmission at a later time.

DIVERSION OF AIRPORT REVENUES

Mr. CARR. To what extent are local communities draining off airport revenues to support off-airport city services, and in your view, would it be a good idea to target our AIP funds to those communities which do not use airport revenues to subsidize city expenses?

[ATA response follows:]

The DOT Inspector General is developing a summary of 20 cases of improper diversion of airport revenues. We believe this is the tip of the iceberg. It is relatively easy for municipalities to overstate the value of city services. This is a common occurrence, which gets more and more attention as city budgets are placed under greater strain. Los Angeles, for example, is going to great lengths to change the prohibitions against revenue diversion, despite the fact that the airport is self-supporting, has no local tax monies invested, and is generally well-run. The city looks to the airport as a potential cash cow.

There are means of dealing with revenue diversion cases, and the FAA is usually very supportive of carrier efforts to identify and rectify minor diversion cases. AIP *should* be targeted to those airports with the greatest proven need for money, not necessarily taken away from those locations which attempt to divert. In the final analysis, the laws and regulations against revenue diversion need to be enforced, but citizens, travelers, shippers, and carriers should not be punished by withholding AIP funds as a result of the malfeasance of local public officials.

AIR TRAFFIC CONTROL EQUIPMENT

Mr. CARR. The ATA has long advocated changes in the way the FAA develops and acquires air traffic control equipment. We would all like to have this equipment designed and built as quickly as possible. But can you offer us any specific recommendations to accomplish that goal?

[ATA response follows:]

As the committee knows, the federal procurement process's rigidity impedes contracting flexibility. Although it is designed to promote maximum competition thereby resulting in low costs its inflexibility delays procurements and may result in increased costs. Given the past experiences of the FAA in acquisition on off-the-shelf components, it may well be time to reexamine current restraints.

Although major system acquisitions may never be appropriate for sole-source contracting, we believe a number of discrete, less complex components of the FAA system, such as Instrument Landing Systems or Precision Runway Monitors, could be legitimately procured through a less rigid process.

We think this committee should consider:

Setting time limits on major acquisitions, including requirements for the completion of all steps from planning to procurement.

Requiring FAA to include in R,E&D contracts a mechanism for moving simply and quickly from the research and development phase to the production of equipment for field implementation without the need for a separate, intervening procurement.

Permit FAA managers to exercise discretion to seek bids on a limited or "adequate" competition basis, similar to the exemptions from the Competition in Contracting Act granted to NASA and the Department of Defense.

Permit FAA managers to make contract awards based upon a vendor's demonstrated record, technical competence, manufacturing expertise and reliability, not just on price considerations alone.

Provide relief from frivolous protests of contract awards. At the least, allow the winning contractor and the FAA to proceed with the procurement while the protest is being resolved.

Authorize a Brooks Act exemption to facilitate acquisition of automated data processing and telecommunications systems. Data processing and communications are fundamental to almost all ATC systems acquired by FAA and, in the future, these elements may all be "embedded," perhaps as small as a few chips on a board. There is no longer justification for the additional complexities introduced by the GSA review process required by the Brooks Act.

Permit FAA the flexibility to modify the current practice, required to comply with the Federal Acquisition Regulations, of specifying systems and products in agonizing, counterproductive detail and move instead to greater use of functional and product performance specifications.

With regards to design competition, sometimes this process is useful but a time limit must be set on when the competition is to end. For example, the Advanced Automation System (AAS) design competition contract was awarded to IBM and Hughes in 1984. The production contract was awarded to IBM in 1988, 4 years later. The cost of the design competition phase of AAS was about $450 million. Design competition has not been an effective tool for FAA procurement of major systems. FAA spent $80 million in design competition for the "Host" computer contract. The production award for the host computer was $191 million. Since the contract called for off-the-shelf equipment, the host contract should not have gone through the design competition phase. What's more, GAO recommended FAA continue the "Host" design competition for another year, which would have cost another $40 million and further delayed implementation of the host computer system. Fortunately, FAA resisted the GAO recommendations and awarded the contract holding the design competition costs to $80 million rather than $120 million. It still took FAA seven years from inception (1981) to last site implementation (1988) to complete the "Host" program.

ATA VIEW OF FAA

Mr. Carr. Mr. Landry has recently characterized the FAA as typically "stolid, often obstinate and out of touch". Could you provide some specific examples which indicate why the association has such a negative view of the agency?

[ATA response follows:]

The FAA is inconsistent with its application of safety criteria. Recent failures by the FAA include abdication of its rulemaking responsibilities in the areas of child restraints and the use of portable electronic devices in the most critical phases of flight. In both of these cases, the recommendations of ATA/industry were cited by the FAA as unwarranted and could best be handled through self imposed criteria and standards. The child restraint and portable electronic device proposals were essentially no-cost regulations that would have set a new, improved safety standard for the industry, yet the FAA failed to take action.

A recent rulemaking, requiring modification of emergency overwing exits, is an example of FAA's shortcomings. The FAA's rule has little regard for the impact that it created for both the air carrier operator and the traveling public. The FAA mandated an impossible six month compliance time, yet allowed operators to submit alternate schedules and plans which have established a wide variety of compliance time tables, and inconsistent standards resulting in different passageway widths on every model airplane. This creates confusion for the traveling public.

In essence, the FAA now dictates cabin configuration which infringe on air carrier marketing strategies yet do not provide consistently applied safety criteria. The FAA ram-rodded the rule through without completing all the proper evacuation tests. I took industry pressure to get the FAA to complete the proper tests months after the rule was issued. The tests showed the rule would not accomplish its goals. Instead of reissuing the rule, exemptions from it have been granted resulting in a hodge-podge of different requirements. The economic analysis that the FAA developed was inaccurate and far short of actual operator costs.

All the above brought to the attention of the FAA during the rulemaking process, yet the FAA failed to respond. ATA petitioned the FAA for postponement of the rule pending further review and study, but we were denied our request. This rule is considered by industry to be one of the poorest safety regulations ever to come from the agency. Industry concerns could have been avoided if FAA had conducted valid test trials, set a consistent standard that would have been applicable for all operators, and imposed a compliance schedule that would have required all cabin modifications at the same time. The irony is that in their haste to get something on the "books", the FAA processed a regulation that needs so much correction any benefits will be delayed.

FAA FORECASTS OF INDUSTRY

Mr. CARR. Many air carriers expanded their fleets over the past 5 years based upon projections of continuously rising air travel. Of course, that demand never materialized, and many analysts now believe that we are seeing a permanent reduction in demand, not just a temporary drop due to the recession.

As Mr. Landry has stated, "business travelers in particular have learned how not to travel." In addition, many companies have permanently cut the number of middle management employees, which provided a significant amount of air travel demand.

What do you think the airlines, the airport authorities, and the FAA should have done differently to forecast the trend better?

[ATA response follows:]

The Air Transport Association does not believe that there has been a significant permanent reduction in the level of demand for air travel. It is true that the rate of growth in air travel has steadily decreased over the last thirty or forty years, but we are still expecting to grow at nearly double the rate of increase in real Gross Domestic Product. The air carriers and the manufacturers have both taken this into consideration in planning for the future. The reductions of the last several years are, in fact, what the industry has come to expect when there is a slump in the economy.

The airlines also do not concede that the business traveler has permanently found alternates to air travel. Business people are not traveling, now, in part because demand for their products has also slumped during this recession. When the business travelers' own business begins to pick up, they will begin to fly more.

What is important is than the airlines be able to provide a cost effective service to the business traveler. Anything that increases the cost of air travel makes it less desirable product. It is true that new technologies such as facsimile machines, express package service, and video conferencing provide alternative methods for the business person to communicate. New technologies often succeed or fail on the basis of their ability to provide a service at a lower cost than the competition. This in part explains the airlines' constant drive to reduce costs and to resist outside efforts to impose added costs. It explains the airlines' constant investment in new aircraft. New technologies in our industry bring lower costs and offer a path for us to remain competitive with alternatives to air travel. In this soft economy it has become difficult for the industry to find a productive place for the new aircraft.

The problem has been that this slump has persisted for more than four years. Typically, when the economy drops into recession, the drop has been sharp and the subsequent recovery has also been sharp—often six or seven percent rates of growth in GDP are common during a recovery. Airlines typically see double digit rates of growth during these recoveries.Excess capacity is quickly eliminated in those circumstances. In this recession and recovery, there was neither a sharp slump nor a sharp recovery. The recession has often been characterized as saucer shaped. Excess capacity has accumulated over a longer period of time than normal and the recovery is not robust enough to quickly eliminate the excess.

The principal difficulty airline planners must deal with is that capacity is ordered on the basis of long-term trends and is ordered well in advance of the time when it is expected to be used. Capacity ordered as much as two or three years ago is being delivered today when it is not needed. It will be needed, but not yet.

The FAA also makes long term forecasts of industry trends and uses their forecast to determine their personnel and facilities requirements. Prior to this recession (1988) they were forecasting long-term rates of growth for domestic travel that would average 4.8 percent. In their 1993 forecast, that estimate was reduced to 3.9 percent. While this seems a significant reduction, their forecast for international travel increased from 5.1 percent in 1988 to 6.6 percent in 1993. Overall, their long-term forecast for the growth rate in passenger travel is roughly the same today as before the recession. However, while it was expected that the number of passengers would reach 800 million by the year 2000, it is now expected that the airlines will not reach that level until sometime after 2005. The airlines view this period of slow growth as an opportunity for the FAA to make some real progress in reducing the level of air traffic control delays an to build a system that will be ready to respond to the resumption in growth that we all expect.

FAA REGULATIONS WITH NO COST/BENEFIT ANALYSIS

Mr. Carr. What FAA regulations does the ATA believe impose an unjustified financial burden on the industry?

[ATA response follows:]

In addition to examples contained in my statement, as well as responses to previous questions, the following is a partial list of just a few regulations in various stages of consideration or implementation for which we believe either no cost benefit analysis or inadequate cost benefit analysis has been performed.

50 percent random drug testing rate.

Air carrier lavatory access.

Airport Access Control Systems (FAR Part 107.14).

Airworthiness Directives in lieu of integration into existing maintenance programs.

Dynamic seat retrofit.

Airport Obstacle Analysis.

Baggage and Cargo Container Hardening.

Failure to implement safety and security regulations on foreign flag carriers.

PFC's on frequent fliers and denied boarding compensation tickets.

Advisory Circular on Design of Aircraft Deicing Facilities.

DC-9 Tailcone Modifications.

Cabin Interior Flammability Standards.

Installation of Digital Flight Data Recorders in Stage 2 aircraft.

Hydrostatic Testing of Halon Fire Bottles.

Aging Aircraft/AD compliance indicators.

EXCESS AIRCRAFT CAPACITY

Mr. Carr. What actions is the industry taking to eliminate excess aircraft capacity? Is it feasible to consider selling excess aircraft to other countries which might be able to use them, such as Eastern European nations?

[ATA response follows:]

Since the end of 1991, ATA members have reduced their firm aircraft orders from 1160 to 924, a reduction of 236 in one year. Deliveries scheduled for 1993 have dropped from 257 to 195, and deliveries scheduled for 1994 dropped from 214 to 156.

Foreign markets are not a realistic market for the sale of many used aircraft. European markets face noise constraints similar to the U.S. market, thereby resulting in European acquisitions being of newer stage 3 equipment. Eastern European markets suffer from a lack of hard currency, not to mention economic standards of living lower than those to which we are accustomed. This situation, coupled with the glut of older aircraft on the market reduces the likelihood that there will be substantial sales of used U.S. aircraft. The African market does not hold much promise either. The fleet of all African airlines combined is only in the 400 unit range.

COST BURDENS IMPOSED BY GOVERNMENTS

Mr. Carr. Mr. Landry stated to the Public Works Committee that "the reaction of government at all levels to the economic conditions in the industry . . . could most charitably be described as lacking to date."

Of course, Federal and State governments did not necessarily help other industries hurt by the past recession, either, such as the automobile, trucking, or retail industries.

Without trying to be argumentative, why should we give special consideration to the airline industry?

[ATA response follows:]

Undoubtedly, problems in other industries, particularly the automobile industry, have also been exacerbated by government, and we seek no special treatment. They too need to be freed from unproductive government cost burdens.

My testimony and my answers to these questions identify a host of areas in which the government has imposed excessive cost burdens. Furthermore, the government has failed to foster U.S. flag carriers' development of international markets at the same time as it has expedited foreign flag carriers' opportunities. Frankly, it is possible that the industry could have turned a profit or at least broken even in the last few years of financial distress had it not been for the cumulative cost burdens and the failure of the U.S. to respond to the needs of commercial aviation, coupled with the imposition of additional regulatory and tax burdens on the industry.

I need only point to the FAA's repeated contortions to undermine Congressional intent on the application of PFC's to frequent fliers as an example of Mr. Landry's comment. Indeed, today, March 25, 1993, the Manager of the Passenger Facility Charge Branch, FAA commented at the ACI-NA/AAAE PFC Implementation Seminar that FAA would do everything in its power to see that PFC's were collected on frequent flier tickets after the expiration of the limitation, imposed by this Committee, expires September 30, 1993.

Since adoption of the limitation, the FAA has issued guidance stating PFC's are to be collected for free travel tickets issued as a result of denied boarding compensation in spite of DOT Accounting and Reporting Directive No. 134 which states that a person traveling on a denied boarding compensation ticket is not to be considered a revenue passenger and the PFC regulations, Part 158.3, state that PFC's are only to be collected from a "revenue passenger".

I use this small example to demonstrate how far the FAA will go to impose cost burdens on the industry, notwithstanding its financial condition, Congressional intent, and the practicality of the requirements.

EFFECT OF PROPOSED BTU TAX

Mr. CARR. ATA has estimated that the Administration's proposed BTU tax would raise costs to the airline industry between $1.4 billion and $2.1 billion annually. How did you arrive at that estimate?

[ATA response follows:]

The airlines have estimated the cost of the proposed BTU tax to be $1.1 to $2.1 billion annually. The lower number is based on the assumption that the tax pass-thru would result in an 8 cents per gallon increase in the price of jet fuel. The American Petroleum Institute, however, contends that refiners, for competitive reasons, will not be able to pass through the full cost of the tax to their customers who purchase bunker fuel since many of these customers would be able to switch to coal or natural gas which are taxed at a lower rate. The American Petroleum Institute estimates that the refiners will pass these costs on to those customers who have no substitute fuel available or whose demand is inelastic. They estimate that the impact on jet fuel will raise the price an additional two to seven cents bringing the total tax increase on jet fuel to 10 to 15 cents per gallon. In 1992, the airlines consumed 11.76 billion gallons in domestic service and purchased another 2.05 billion gallons in this country for international service bringing total purchases in the U.S. to 13.81 billion gallons. At 10 cents per gallon the added cost to the industry would be $1.4 billion. At 15 cents per gallon the added cost to the industry would be $2.1 billion.

FAA ATC STAFFING

Mr. CARR. ATA has also suggested that the FAA should have more flexible personnel rules to allow more efficient allocation of staff among air traffic control facilities. Why isn't the FAA able to allocate its staff efficiently today, and what specific changes do you recommend?

[ATA response follows:]

FAA, like all Federal agencies, must comply with staffing ceilings established during the budget process along with regulations promulgated by the Office of Personnel Management (OPM). Thus, FAA has limited flexibility in making short-term adjustments to changing demands for services. This is especially true in the air traffic control service FAA attempts to satisfy personnel needs in certain high cost-of-living locations. The agency needs a more comprehensive and rational program for "hard-to-staff facilities" located within the high cost-of-living areas.

To ensure that FAA has adequate numbers of fully qualified personnel to staff ATC facilities and perform other safety services the agency needs to:

a. Continue the pay incentive program permanently to staff and retain personnel at the hard-to-staff facilities within designated high cost-of-living locations. Limit the ability of key personnel to transfer from hard-to-staff facilities.

b. Promote local hiring for hard-to-staff facilities. Promote hiring at entry-level directly from accredited educational institutions without requiring students to satisfy OPM civil service register requirements.

c. Adopt a mandatory transfer policy for present employees, and as a condition of employment for new hires, so that the agency is able to transfer personnel with appropriate skills when necessary.

d. Provide the necessary funding for permanent change of station (PCS) use. Without these funds it would be impossible to balance the national staffing levels.

Adequate staffing levels are essential to safe and efficient operation within the National Airspace System (NAS).

BANKRUPTCY LAWS

Mr. **Carr.** Mr. Durham, American has made clear its view that the bankruptcy laws need to be revised in order to improve the financial health of the airline industry. Because firms under chapter 11 of the bankruptcy code are allowed to suspend payment of long-term obligations, they can offer prices which cover only short-term avoidable costs, while other airlines must also cover their cost of capital.

What evidence can you offer to support your view?

[American Airlines response follows:]

In bankruptcy, airlines may take a number of steps to immediately and dramatically lower costs. Most significantly, bankrupt carriers can reduce interest and lease payments. For example, the attached exhibit from Continental Airlines' bankruptcy filing asserts that as a result of its Chapter 11 filing, its annual interest and lease expense will decline by more than $300 million. Continental's reduction in interest expense alone gives it the ability to absorb an additional $7 per passenger price reduction. At American, a $7 per passenger fare cut would result in $600 million less revenue per year. Yet, American must continue to meet its debt and interest obligations.

Bankrupt carriers have been allowed by the IRS to suspend payments to the Pension Benefit Guarantee Corporation (PBGC) thus further paring cash outflows. Ultimately these actions also increase PBGC costs for healthy carriers. At AMR, despite the fact that our plans are fully funded, annual PBGC insurance premiums have increased from $129,000 to $5.1 million during the last seven years—a forty-fold increase.

As they can legitimately threaten to cease operations, bankrupt carriers can and do exert great leverage in negotiating price reductions from suppliers and wage and benefit cuts from employees. For example, after filing for bankruptcy, America West was able to implement a number of measures including an indefinite wage freeze and 10% across the board salary cuts to reduce costs.

Continental also reduced wages post-bankruptcy, lowering payroll by 10% in July 1992. Recall that during its first bankruptcy in the mid-eighties, Continental used bankruptcy to slash wages for some employee groups by as much as 50%. With all its recent cuts and concessions, Continental now enjoys a $1.7 billion annual cost advantage versus American.

MarkAir, an Alaska-based carrier operating in Chapter 11, provides an excellent example of how Chapter 11 works. The airline's management boasted that bankruptcy protection gave it a competitive edge. In discussing the extraordinarily low fares it had just announced, MarkAir President Michael Bergt told the Seattle Times on August 11, 1992, "We can offer such low prices because we're enjoying the lowest cost structure in our history."

It is important to note that bankrupt carriers are not the only airlines reducing fares on a short term basis to generate cash. They merely represent the weakest among undercapitalized industry participants. Adequate capitalization is a primary driver of success in the industry, given its cyclical nature. That is, carriers must be prepared for the inevitable downturns. USAir and Northwest Airlines typify carriers with this problem. As such, they exhibit behavior similar to that of bankrupt airlines including offering short-term cash generating fare specials and pressing labor groups for wage concessions. USAir has extracted wage concessions estimated to be worth $100 million per year from all its employee groups and Northwest is seeking $300 million in annual wage, benefit and work rule concessions.

In past downturns, customers lost confidence in such undercapitalized carriers causing them to cease operations, enter bankruptcy and disappear. Braniff's demise in 1982 typifies this scenario. Today however, because a number of carriers including Continental, Eastern, Pan Am, TWA and America West have operated in bankruptcy for extended periods of time, passengers now expect a bankrupt carrier to continue operations indefinitely. This, along with the reduced costs afforded by bankruptcy protection, allows bankrupt airlines to continue selling tickets and generating positive cash flows.

There is also a consumer protection aspect to this problem. When a carrier finally ceases operations, the ticket holding consumer is left holding the bag. Towards the end of Midway's bankruptcy the company offered special senior citizen coupon books to generate cash. With Midway's demise, many senior citizens were left holding worthless coupons. To protect consumers from this problem was one of the original reasons for the C.A.B. financial fitness standard for airlines.

While the threat of bankruptcy should in theory deter undercapitalization and aberrant pricing behavior, the protections afforded by the U.S. bankruptcy system have instead fostered these actions.

Exhibit I

Excerpt from the Third Amended
Disclosure Statement, Continental Airlines
Plan of Reorganization under Chapter 11

Based on the third quarter of 1992, CAL's annualized total system cost advantage as compared to American, the most efficient of CAL's competitors, equates to approximately $850 million. Although management expects such cost advantage to remain substantially intact in the near future, there can be no assurance that such cost advantage will not dissipate over the longer term, as airlines reconfigure their fleets and labor costs change. Management intends to take advantage of NewCal's lower cost structure to provide a superior product directed toward the high yield traveler.

CAL's cost advantage is partially offset by CAL's higher than average aircraft lease and maintenance costs. Over time NewCal will seek to bring such costs in line with industry averages through acquisition of new aircraft.

The Chapter 11 filing has enabled CAL to achieve a significant reduction in aircraft lease expenses and enhanced its ability to dispose of older aircraft and rationalize its fleet structure. CAL expects that actions taken during its Chapter 11 reorganization and in connection with confirmation of the Joint Plan will have the effect of reducing its net annual interest and lease expense by more than $300 milli from levels existing prior to its Chapter 11 filing. Additionally, management expects, based on current fleet plans, that by 1997 NewCal will benefit from approximately $215 million of annual maintenance cost savings and $165 million of annual fuel cost savings as a result of the acquisition of replacement aircraft, although such fuel and maintenance cost savings will be offset largely, if not entirely, by higher aircraft ownership and lease costs related to such aircraft.

For several reasons, CAL's maintenance costs have been higher than industry averages in relation to the size of CAL's operations, despite the good productivity of CAL's maintenance personnel. CAL's fleet contains a wide variety of aircraft types and configurations, reflecting the growth of CAL through merger with other established airlines. This fleet diversity eliminates certain maintenance cost savings that could otherwise be achieved by an airline of CAL's size. As NewCal modernizes and standardizes its fleet over the next several years, NewCal should be able to achieve maintenance cost savings. Also, in part because CAL does not operate an engine overhaul facility, CAL obtains maintenance services on a contract basis from third parties--usually at a higher cost than if such services were performed in-house. Management expects that NewCal will be able to achieve substantial savings in maintenance expense through its alliance with Air Canada. Air Canada operates three comprehensive maintenance and overhaul facilities and currently performs substantial contract maintenance, including engine overhaul service, for other airlines. In connection with the Investment Agreement, Air

Mr. CARR. Former Assistant Secretary of Transportation for Policy and International Affairs, Jeff Shane was recently quoted as saying: "Nordstrom has not come to Washington screaming about the unfairness of competing with Bloomingdales", even though the parent company of Bloomingdales is under chapter 11 protection. Why should the airline industry get special consideration under our bankruptcy laws that retail, manufacturing, or other industries which may also be experiencing financial difficulties don't get?

[American Airlines response follows:]

We do not espouse special consideration for any industry under our bankruptcy laws. We are outspoken in seeking change because the impact of today's provisions affect our industry more severely than most.

The impact of today's bankruptcy laws is particularly acute for airlines compared to other industries, including retaining, because of the intensity of price competition caused by the fundamentals of the business. First, air travel is perceived as a commodity and, as a result, airlines compete for customers primarily on price. Second, customers have perfect market knowledge—one call to a travel agent provides instate access to the offerings and prices of all competitors. Finally, because variable costs are relatively low once a schedule is established, and an unsold seat becomes worthless the instant a flight departs, competing air carriers are always tempted to reduce price to increase market share and total revenue. Stable carriers resist this temptation, knowing that they must cover both variable and fixed costs to provide an adequate return on investment. Bankrupt carriers, capable of lowering their costs and unconcerned with return on investment, respond to these fundamentals by dropping their prices. In this "perfect market" where competitive price information on competing commodity-like offerings is readily available, the stronger carriers are forced to match these discounted fares.

By contrast, the presence of a bankrupt retailer does not necessarily drive prices to an uneconomic level. A retailer sells products which are not viewed as a commodity; customers perceive quality differences and are willing to pay for them. Also, customers do not have instant access to prices at all retailers. For instance, to comparison price the cost of a garment would require a time consuming trip around town. Contrast that to the one telephone call (toll-free) that is required to identify prices at any individual airline. Retailers also have many opportunities to sell the same product because their products are not perishable. While there is a carrying cost for retail inventory, at least it doesn't disappear if not purchased immediately. Finally, bankrupt retailers cannot sustain prices below their actual cost of goods sold.

Bankrupt carriers can produce working capital by mortgaging their future. They are motivated to sell future travel at deep discounts or unload valuable assets in order to raise cash for current operations. Retailers do not have these same opportunities to generate working capital.

Lastly, airlines compete on a broader basis than retailers. Retailers put stores in selected markets, minimizing the number of locations in which, for example, Bloomingdales and Nordstrom directly serve the same customer. By contrast, airlines serve many routes and many cities. When one bankrupt air carrier drops prices in an effort to influence market share it may impact the entire system.

FARE WARS

Mr. CARR. American Airlines executives have also blamed the airlines under chapter 11 protection for starting the downward spiral of fare wars over the past couple of years. Denying that claim, one of the other carriers released data which indicates that 29 percent of the fare cuts last year were initiated by chapter 11 airlines and 36 percent were initiated by Big Three airlines. Do you agree with these figures?

[American Airlines response follows:]

Emphatically not! We are at a loss to explain how these numbers were generated. In 1992, carriers operating under Chapter 11 initiated 88 percent of the fare cuts (see exhibit 2 which lists all fare cuts affecting over 200 markets). American, United, and Delta, combined, initiated only 2 percent of the fare cuts while undercapitalized but not bankrupt carriers, (Northwest and USAir) initiated 10 percent. We separate Northwest and USAir because we feel those carriers who are undercapitalized exhibit pricing tendencies similar to carriers already in bankruptcy.

Further, we should distinguish between a cash-generating sale and a revenue-stimulating sale. A carrier in need of cash will initiate a deeply discounted sale that will expire quickly, yet be valid for travel over an extended period of time with little or no advance purchase required. It is this type of fare action which is most damaging; cash flow is increased in the short term, but industry revenue is reduced. In contrast, revenue-stimulating sales are aimed at increasing industry revenue by stimulating new traffic during low-travel periods.

TWA's 1992 actions are a good example of fare cuts which are damaging to the industry. All told, TWA initiated 35 fare cuts, offering an average discount of 32%. On average, these fare cuts were available for only 5.9 days. Even this average selling period is somewhat overstated, since only 3 of 35 sales ere available for more than 3 days. Northwest's actions were also harmful. They initiated four fare cuts for 1992, with an average discount of 41% and average duration of 7.3 days.

In 1993 America West has been responsible for half of all fare cuts. Their strategy has been to continually roll-over their Winter Sale special. This effectively produced a semi-permanent sale, which to date has lasted four months. Northwest has initiated the remaining 1993 fare cuts. On average, Northwest's fare actions have discounted travel by 35% and have been available to consumers for only 4.8 days.

Reaffirming our results, Aviation Forecasting & Economics (AF&E) has stated in a recent study that the primary cause for the decline in industry yields, the amount a passenger pay to fly one mile, are pricing practices resulting from insolvent carriers' needs for cash. In fact, AF&E states that these pricing policies actually begin years before a carrier files for bankruptcy.

Exhibit 2

Major Fare Reductions 1992 - March 1993

YEAR	CARRIER	FARE ACTION	DISCOUNT	SELLING DATES	TRAVEL PERIOD	SCOPE	ADVANCE PURCHASE
1992	HP	Winter Sale 1	18 - 25%	1/11 - 2/29	To 3/31	200 - 300 city pairs	14
1992	TW	Short Sale	40 - 45%	1/28- 1/31	To 3/15	790 Mkts To/From 19 cities	3
1992	HP	Winter Sale 2	18 - 25%	2/13 - 2/29	4/1 - 5/31	200 - 300 city pairs	14
1992	TW	3-Day Sale	40 - 45%	2/18 - 2/21	To 3/31	490 markets	3
1992	TW	Via JFK Special	10 - 15%	3/20 - 5/31	To 5/31	300 NE-West & NW-Fla. Mkts.	0
1992	US	"Sun" Special	Approx 10%	4/13 - 6/7	4/23 - 6/14	214 MW/NE-Fla Mkts	7
1992	TW	Business Savers	23 - 35% off Y26	4/13 on	4/13 on	Much of D48	0
1992	TW	Multiple One-Day Sales	Approx. 33%	4/9 thru to 5/30	To 6/13	Over 30 One or Two-Day Sales	0
1992	NW	Grown-ups Fly Free	50%	5/27 - 6/5	To 8/13	D48 - 50% off for child/adult pairs	7
1992	CO	Summer Sale 2	Avg. 25%	7/9 - 7/17	To 8/15	Majority of D48	7
1992	CO	Summer Coupon Sale	20 - 35%	8/2 - 8/4	To 8/20	Majority of D48 - for pairs	0
1992	DL	Fall Special	30%	7/31 - 8/31	To 12/14	D48	14
1992	NW	Fall Sale Coupons	40 - 44%	8/23 - 8/31	To 12/14	D48	14
1992	TW	Goodbye Fares	5 - 25%	9/17 - 10/24	To 10/24	348 Markets	0
1992	CO	Fall Special 1	21 - 42%	10/13 - 10/19	To 12/15	643 Markets	7
1992	CO	Fall Special 2	21 - 40%	10/27 - 11/2	To 12/15	670 Markets	7
1992	HP	Thanksgiving Special	25 - 40%	10/31 - 11/16	To 12/3	266 Markets	7
1992	NW	Fall/Winter Sale 1	36%	11/8 - 11/12	To 2/25	2078 Markets	14
1992	NW	Fall/Winter Sale 2	36%	11/8 - 11/16	To 2/25	967 Markets	14
1992	HP	Winter Sale 1	28 - 33%	11/22 - 12/11	To 2/4	371 Major Markets	14
1992	CO	Winter Sale	29 - 35%	12/1 - 12/11	1/5 - 2/14	D48	7
1992	HP	Winter Sale 2	32 - 38%	12/10 - 1/4/93	To 2/4	371 Major Markets	3
1993	HP	Winter Sale 3	33%	1/4 - 1/21	To 3/10	371 Major Markets	7
1993	NW	Take Along Fares	20 - 40%	1/12 - 1/17	None	D48 - Complex Group Pricing	14
1993	HP	Winter Sale 4	33%	1/20 - 2/17	To 5/31	371 Major Markets	14
1993	NW	Winter/Spring Sale 1	30 - 44%	2/15 - 2/19	To 5/31	To/From 17 cities	14
1993	HP	Winter Sale 5	20 - 30%	2/17 - 3/10	To 6/10	371 Major Markets	14
1993	NW	Winter/Spring Sale 2	30 - 44%	2/20 - 2/26	To 5/31	To/From 19 cities	14
1993	NW	Winter/Spring Sale 3	30 - 44%	2/27 - 3/3	To 6/30	D48	14
1993	HP	Winter Sale 6	20 - 30%	3/10 - 3/24	To 6/10	371 Major Markets	14

NOTE: Excludes fare increases, permanent fare restructures (NW's Now MaxSaver & AA's Value Plan), and fare reductions affecting fewer than 200 markets

Mr. CARR. Other carriers have claimed that last year's devastating half price summer fare war was the result of American's new pricing policy. Do you agree with this statement?

[The information follows:]

No, the Value Plan did not cause the half price summer sale. Northwest chose to initiate the summer sale.

We had high hopes for value pricing. Our analysis showed that a simplified and more rational fare structure would produce higher revenues and lower costs—for ourselves and other carriers—while simultaneously addressing the frustration and anger of our customers over the complexity of the fare structure. When we implemented value pricing, we also announced that we would remain price competitive, where possible, within the confines of our newly simplified structure.

Although the initial reaction to value pricing was almost universally favorable—from consumers, the media and other industry observers—unfortunately, almost immediately TWA and USAir instituted fares that were below our AAnytime and PlanAAhead 14 day advance purchase fares. After studying the situation for a week, we decided to match these price cuts within the four-tier structure of the Value Plan. This kept our promise of simplicity and fairness to travelers and helped preserve the virtues of the Value Plan.

Six weeks after the introduction of the Value Plan, Northwest initiated a 50%-off sale for most of the leisure segment of our business—a promotion whereby grownups would "fly free" when accompanied by a child. The sale was immediately matched by USAir and United on a system wide basis. We declined to impose a child/adult restriction on our sale fares because doing so would unfairly discriminate among passengers and was contrary to the basic tenet of fairness under the Value Plan. At the same time, however, we had to remain price-competitive or cede a huge amount of business. Therefore, we responded as we did.

OVERCAPACITY

Mr. CARR. To what extent is this problem the result of overcapacity—both in aircraft and in airport facilities?

[American Airlines response follows:]

Overcapacity is not the problem. The problem, as detailed in Question one, is aberrant pricing by undercapitalized carriers. Overcapacity is a fundamental reality in the airline business. During the record profit year of 1988, industry load factor averaged 62.5%. For 1992, industry load factor increased to 63.7%. The profits, however, have vanished as a result of the irrational pricing behavior of undercapitalized and bankrupt carriers. The steady decline in airline yields demonstrates the real impact of undercapitalized carriers. From 1988 to 1992, yields have declined by 15 percent in real terms.

Those who say that overcapacity is the result of overinvestment are turning reality upside down. American, Delta and United were earning healthy returns in the late '80's as a result of building efficient, well-integrated systems. These new systems provided more and better service to consumers in an ever-increasing number of cities, big and small. Further investment in new cost-effective, quieter and safer aircraft was justified based on these strong returns. There was no way for anyone to predict the world economic decline and the effects of Chapter 11.

In our industry, as in every industry, the benefits of competition are accomplished by a continuing process of investment in new and better facilities. Rarely does demand grow in lock step with supply. This is particularly true in cyclical businesses such as the airline industry. During periods of supply/demand imbalance, the least efficient capacity is forced out of the market. While this phenomenon is unpleasant for inefficient suppliers, it is a fact of life in all non-regulated industries. Strangely, however, when it occurs in the airline industry, those carriers that have invested, grown and added new jobs are condemned for supposedly causing the failure of others. Why don't we condemn WalMart for entering new markets and providing consumers with the products they desire but at the same time frequently forcing out of the market, smaller, less efficient competitors? Or why not criticize PC manufacturers for investing in technology and obsoleting earlier, less efficient models? I don't know why the airline industry is singled out, but we should allow the free market system to act in the same way it does in other industries to force the exit of inefficient carriers. To date, what is actually happening, is that the stronger, more efficient competitors are being forced to draw down capacity while the weaker carriers are being artificially supported.

In terms of airport facilities, there is a clear need for more runways and a more efficient air-traffic control system. Despite collecting taxes supposedly earmarked for infrastructure improvement, the government has failed to provide sufficient facilities. As a result, airlines are burdened with increased crew time, fuel burn, and delays. Passengers do not like this situation and it reflects badly on the industry. In 1969, ATC delays and excessive aircraft delays caused the institution of "temporary" restrictions on the slots of four major airports (JFK, LGA, DCA & ORD). These "temporary" restrictions are still in place 24 years later. The recent sale of 40 TWA O'Hare slots for over $100 million clearly demonstrates that demand for these slots significantly exceeds supply. In order for airlines to expand at high demand locations, the basic infrastructure (including airspace control and runways) must be expanded.

If there is an oversupply of other types of airport facilities (ie: airports and terminals), this should not be blamed on airlines, who have only limited control over these expansions. Communities often seek to stimulate their economies through the creation and/or expansion of airport facilities which are not justified by current demand.

Mr. CARR. What actions are the "Big Three" airlines taking to wring out excess aircraft capacity from the system?

[American Airlines response follows:]

The "big three" airlines, as a group, have been moving rapidly to reduce their capacity. In the process this will eliminate many jobs, for both the airlines as well as the manufacturers. Just this month, American announced plans to ground 25 DC–10 aircraft. This grounding is only a part of American's larger plan to shrink unprofitable operations. Both United and Delta have reportedly taken similar measures to slow the increase of their capacity. The following chart lists dramatic cuts in capital expenditures for the three largest U.S. carriers, most of which are aircraft related.

INDUSTRY CAPITAL SPENDING CUTS

	Amount (billions)	Aircraft
American	$8.5	[1] 109
Delta	5.0	[2] 100
United	6.7	[3] 79
Total	20.2	288

[1] By 1995.
[2] By 2001.
[3] By 1995.

RETURN TO PROFITABILITY

Mr. CARR. Some Wall Street analysts believe the industry will return to profitability by the middle of 1994. Do you share their optimism? Why or why not?

[American Airlines response follows:]

Yes, but profitability does not equate to a sufficient return on invested capital. For instance, AMR's operating loss for 1992 was $25 million on average assets for the year of $17.5 billion (a negative return of 0.14%). If AMR had invested this asset base in One-Year Treasury Bills, it would have received a return of $677 million, or 3.9%. Obviously, our investors require more than simply a risk-free rate of return. As demonstrated by the recent downgrading of our debt, AMR has become a riskier investment. Shareholders who have invested their capital with AMR expect and should receive an adequate return, given the riskiness of the industry.

American's investment has nearly doubled since 1988. In that year American earned an 8.8% return on average assets ($806.5 million on $9.1 billion of average assets). In order to achieve that return for 1992, American would have had to achieve operating earnings of $1.5 billion. Unless some very fundamental problems facing the carriers are solved, we do not expect to earn adequate returns anytime in the foreseeable future.

HUBS

Mr. CARR. If airlines respond to the problem by closing smaller hubs, won't that mean that more traffic will be directed to the larger, "fortress" hubs, which have higher percentages of travel delay?

[American Airlines response follows:]

We do not want to close hubs; the consumers and citizens served by those hubs do not want them to close either. Airline hubs provide enormous benefits for the cities that host them and are the means by which smaller surrounding cities enjoy a greater frequency of service. The aggregate economic impact to our smaller hubs, Raleigh/Durham, Nashville, and San Jose, is over $1 billion annually.

With that in mind, we are doing everything possible to save these hubs. We are continually looking for more efficient ways to utilize our aircraft and to optimize our schedule. We have substituted Eagle aircraft on routes where passenger demand will not support jet service. We have re-timed our bank structure to offer more attractive departure times for local passengers. In addition, we have added flights to top business destinations. However, American's efforts alone are not enough.

State and local officials are also helping. They are encouraging the community to support their hub and American and communicating with the Administration in Washington about their and American's needs. North Carolina's Governor, Jim Hunt, has organized an action committee to address the need to increase traffic at our Raleigh/Durham hub. Officials from Nashville have been active in helping us apply for new international routes. In addition, officials are aggressively campaigning to attract business to their community, and they are sponsoring promotions in the surrounding cities to encourage passengers to travel through their hub. They are also working to help us reduce our costs as shown by San Jose's commitment to reduce our rent, landing fees, and federal inspection charges. However, even their added effort may not be enough to save these hubs. In the end, given the current state of the industry and current federal government policies, we will have no choice but to make responsible decisions for our shareholders.

PROFITABILITY

Mr. CARR. Mr. Seiden, Northwest Airlines suggested to the Public Works Committee that no new taxes should be imposed on the airline industry "until it returns to profitability". How would profitability be measured in this case? For example, would small profits be enough to renew taxes? How long must profitability be sustained to ensure that it is not temporary?

[Northwest Airlines response follows:]

In order to be able to attract capital over the long term, we have to achieve a rate of return on investment comparable to other industries. For purposes of calculating when to restore taxes, I recommend that profitability be established when the industry's rate of return is 3% for one full calendar year.

NORTHWEST AIRLINES TICKET TAXES

Mr. CARR. You have called for the ability to offset ticket tax payments with net operating losses, in essence, a tax deduction. About how much does Northwest pay in ticket taxes, and what percentage is that of your total operating expenses?

[Northwest Airlines response follows:]

In 1992, Northwest Airlines paid $391.4 million in ticket and cargo excise taxes. Our consolidated operating expenses for 1992 are $8.504 billion (does not include investment expenses, interest expenses, foreign exchange, or gain or loss on sale for book purposes). The ticket tax payment is 4.6% of our consolidated operating expenses.

DEBT LOADS

Mr. CARR. I've seen the annual interest on debt at our major airlines estimated at $7 billion. By comparison, all airlines paid a total of $4 billion in ticket tax revenues in fiscal year 1992. Does this indicate that the problem is not the Federal ticket tax, but perhaps paying off the large debt loads assumed by air carriers over the past few years?

[Northwest Airlines response follows:]

Although I am not in a position to respond for other airlines, I can give you a rough idea of what the debt load for Northwest is. Because industry conditions have required the company to seek additional financing since the acquisition (through various asset sales, debt placements, suspension of dividends, etc.), and this financing has been secured at an unknown premium because of the additional debt, it is difficult to determine the losses attributable specifically to this debt. A simple approach to the cost of the debt is as follows. The original debt was $3.1 billion. The current debt is $2.5 billion. At current interest rates, this debt costs $180–200 million per year.

All major airlines have heavy debt loads. However, the majority of that debt, generally speaking, is a result of vast capital expenditures such as the federally-mandated purchase of Stage 3 aircraft. If airlines earned a competitive rate of return on investment, we could acquire aircraft with retained earnings and rely less on debt. Our low rate of return is partly a result of our heavy tax load.

NORTHWEST AIRLINES NOL PROPOSAL

Mr. CARR. As I understand it, your proposal would require Southwest Airlines and others currently earning a profit to pay taxes which other airlines would have reduced or fully offset. Would this be fair to all airlines?

[Northwest Airlines response follows:]

Southwest is the only major U.S. carrier currently earning a profit. It is true that Southwest would not benefit from the NOL offset at this time. However, the tax code is already structured in the manner we suggest and our proposal does not alter that principle. Northwest has the ability to carry forward its NOLs fifteen years (after carrybacks of three years) to offset future income tax liability. Our NOL proposal allows Northwest (and other airlines) to use that offset now when it is desperately needed instead of in the future. Because Southwest is in the fortunate position of being profitable, it has no NOLs to carry forward. Therefore, under the present tax regime, if Northwest turns profitable in 1994, and Southwest remains profitable in 1994, Southwest will pay corporate income taxes but Northwest will not because of its offsetting NOL carry forwards. No one ever has claimed that this is "unfair." Therefore, claims of unfairness regarding Northwest's NOL proposal are "red herrings." Our NOL proposal does not give us a new tax advantage; it merely accelerates what we already have.

Mr. CARR. By our calculations, the current balance in the aviation trust fund will be eliminated in a few years due to repeal of the penalty clause in 1991. We are currently spending down the balance. If future revenues drop, then the FAA budget will have to be reduced accordingly. Have you estimated the impact of your proposal on future revenues into the aviation trust fund?

[Northwest Airlines response follows:]

Although it is difficult to estimate with detailed precision what the NOL proposal will cost the trust fund (because taxpayers regard their tax information as confidential), I can give you a rough estimate. The industry holds approximately $6.6 billion in unused NOLs carry forwards. At the corporate tax rate of 34%, the maximum reduction in excise tax payments is approximately $2.2 billion. However, the deduction would be less. Several carriers are still carrying their NOLs back three years (as required by law) and therefore would not be able to use their NOLs to offset their excise tax liability. Therefore, we believe that the total one time loss to the trust fund would be approximately $1.9 billion.

Mr. CARR. Your statements indicate a belief that the Federal Government should allow flexibility in your tax payments in order to cut near-term costs and facilitate the industry's return to economic health. How successful has the industry been at getting the financial community to restructure debt payments, which would appear to serve the same overall purpose?

[Northwest Airlines response follows:]

Again, speaking only for Northwest, I believe that we have been quite successful in getting the financial community to restructure our debt. In December 1992, our debt was restructured. We are currently negotiating with our unions for $900 million in concessions; following the successful conclusion of these negotiations, we contemplate that our debt will be again restructured. However, I disagree that this restructuring serves the same purpose as the NOL offset. Although they both have the effect of putting money in our hands, the debt is still there and must be repaid. The NOL proposal takes an "asset" that we already have under existing tax law and accelerates its use. The debt is a liability and the NOLs are a future positive asset.

FAA REGULATIONS WITH NO COST/BENEFIT ANALYSIS

Mr. CARR. You have stated that the Government should show greater restraint in introducing new, expensive regulations. Could you give us some examples of the regulations which should be deferred or stopped outright?

[Northwest Airlines response follows:]

We concur with ATA's list.

OVERCAPACITY

Mr. CARR. You are reported to have told the Public Works Committee that there is no domestic overcapacity problem. Many executives and analysts would dispute that statement. Would you explain your position?

[Northwest Airlines response follows:]

John Dasburg, our CEO, testified before Public Works on February 24 on the state of the airline industry. He stated that the problem is that airlines are forced to price to demand and not to cost, resulting in an underdemand problem and not overcapcity. Our prices do not allow us to cover our costs, much less make a profit. To support his position, Mr. Dasburg pointed out that, in 1988 (the last profitable year for the airline industry), there were 530 billion ASMs (Available Seat Miles). In 1992, there were 543 ASMs, only a .6% increase. RPMs (Revenue Passenger Miles) likewise increased only marginally. In 1988, RPMs were 326 million while in 1992 they were 341 billion, only a 1.1% increase. These statistics show that overall capacity hasn't increased significantly; and although the Big Three (American, United, Delta) have greatly increased their own capacity, several carriers have exited from the market. We are seeking temporary and permanent tax relief to lower our federally-mandated (through taxes) cost structure.

PASSENGER MANIFEST

Mr. DELAY. Mr. Merlis, Passenger manifest is an issue that could be a potential nightmare for the airlines. The idea of tracking every passenger's next of kin for the sole purpose of identifying those individuals should there be an accident is somewhat unnerving even to the most frequent of flyer.

What is the current situation with regards to passenger manifest information?

[ATA response follows:]

The Department of Transportation published an Advance Notice of Proposed Rulemaking (ANPRM) in 1991 that would have required U.S. airlines to obtain the name of a "next of kin" and the phone number of an emergency contact for each passenger traveling internationally. To comply with this initiative, U.S. air carriers would be required to modify their computer reservations and departure control information systems, obtain the required information from passengers either at the time of reservation or check-in, and install equipment at departure gates to verify passenger boardings.

Last year, during the government-wide review of all pending regulations, ATA identified this issue as one DOT should include in the moratorium, stating it would create a competitive disadvantage for U.S. carriers, not to mention the substantial initial and recurring costs involved with no commensurate public benefit. On September 23, 1992 conferees on the FY 1993 DOT appropriations bill (H.R. 5518) agreed to funding limitation provision which prohibits DOT from issuing a final rule on international airline passenger manifests unless it applies to both U.S. and foreign flag carriers. As you know, because this provision was attached to an appropriations bill, DOT could issue a final passenger manifest rule once this one-year funding limitation expires, unless it is reimposed for FY 1994.

Mr. DeLay. What costs would be associated with this procedure?

[ATA response follows:]

The Air Transport Association conservatively estimates that a passenger manifest rule would cost U.S. airlines $77 million to $95 million annually, in addition to one-time start-up costs of approximately $50 million.

AIRCRAFT MANUFACTURING

Mr. DeLay. It appears that the President is determined to set the stage for a trade war with foreign aircraft manufacturers. He has stated that because of their apparent subsidies, they are unfairly undercutting domestic manufacturers and thus hurting our economy.

If the Administration puts this country into a trade war with foreign aircraft manufacturers, what will this mean for the airline industry?

[ATA response follows:]

The U.S. airlines are expected to spend about $13 to $15 billion for new aircraft each year to beyond the turn of the century. These airplanes will be necessary to accommodate the expected growth in demand for air transportation and to replace older and noisier aircraft in the present fleet.

The airlines want to make these investments in the most efficient and low cost way possible and therefore are interested in there being healthy competition between airplane and engine manufacturers. The more vigorous the competition, the better for the airlines.

The prospect of a manufacturer selling subsidized aircraft with a consequent lower price looks attractive to the airlines. However, if subsidy should drive the price down to a level that one or more of the competitors withdraws from the market, that, in the long run, would not be good for the airlines.

Mr. DeLay. How will the Administration's actions affect cost for aircraft?

[ATA response follows:]

The average price of a new aircraft with its engines is $54.9 million.

AIRLINE COSTS

Mr. DeLay. There are numerous taxes, fees, and other costs incurred by the airlines, such as landing fees, custom fees, fuel taxes, passenger facility charges, employment taxes, property taxes, et cetera.

Roughly, what is the total in taxes, fees, charges, et cetera, paid by each airline yearly?

[ATA response follows:]

The airline industry pays (or collects) the following federal taxes each year:

10 percent Domestic ticket tax, $4.4 billion.

PFC's, $1.2 billion, when fully implemented.

$6 International Departure Tax, $225 million.

$5 Customs User Fee, $110 million.

$5 Immigration User Fee, $160 million.

$2 Agricultural Inspection User Fee, $80 million.

1992 Payroll Taxes (FICA, Medicare and FUTA), $1.46 billion.

1992 AMT, $60 million.

Size of AMT Credit Carryover at the End of 1992 (This represents past payments of AMT taxes which have not been credited against a portion of the airline's regular tax liability), $673 million.

State sales tax on fuel (for 19 states with state/local sales taxes), $284 million.

This listing indicates that our 1992 tax burden was around $8 billion excluding state taxes (income, sales, use, property and per gallon fuel taxes) and Federal telecommunication taxes paid by the airline industry.

COSTLY REGULATIONS

Mr. DELAY. If you had to prioritize the top three onerous and/or costly rules or regulations, what would they be?

[ATA response follows:]

The best approach to looking at the cost of regulation is probably as "families" of regulations rather than each specific rule in isolation. This is the case because, very often, it is the interrelationship of rules and their impact on real world operations, not merely their stand-alone costs, which causes the greatest impact on the industry.

A prime example arises in the area of security for international operations. In this area U.S. carriers are subject to an extensive array of FAA regulations which are not applicable to our foreign competitors. The failure to apply such regulations uniformly to all competitors—U.S. and foreign—has a serious adverse impact on U.S. interests. This occurs both in terms of direct costs and, more significantly, in terms of diversion of high value business travel traffic to foreign airlines which are viewed as presenting "simplified", streamlined check-in procedures, etc. While this situation has been prominently identified as a critical competitiveness issue for years, the FAA remains intransigent regarding corrective action.

A similar situation exists in the area of safety regulation. Again, our argument is not so much with the regulations themselves (though surely many exemplify the excesses of regulatory authorities in search of a mission) as it is with the competitive imbalance they produce. Rules in this area—drug and alcohol testing, Type III exits, additional dispatch requirements, medical kit requirements, Digital Flight Data Recorder demands, etc.—all work to inhibit the U.S. carriers' ability to compete when they are not uniformly applied to *all* carriers transporting U.S. passengers. The simple truth is that if these regulations are justified for the protection of United States passengers, (which is not uniformly the case) they ought to be applied equally to all airlines seeking that traffic. The regulators apparently disagree.

Finally, in the environmental area regulatory expansionism threatens to overwhelm. The single most expensive regulatory program currently underway is the Stage 3 fleet transition program mandated by Congress in late 1990. This regulation, the cost of which could run as high as $140 billion in "seat for seat" replacement costs, has added a tremendous burden to the industry. This is, however, a burden which the carriers are committed to carrying forward in order to secure the enhanced protection from "scatter shot" local noise regulations. This protection is essential to defend against the uncoordinated local rules that were forcing dramatic, costly and illogical schedule modifications throughout the '80s. Unfortunately, even as these protections move into effect, the trend in local environmental regulation outside of the noise area threatens still more inartful and excessively costly regulation. Again, the point is that while the airlines are determined to operate in an environmentally compatible fashion, the threat of uncoordinated, poorly understood and excessive regulation presents an alarming threat to the long-term health of this industry.

FUEL TAX

Mr. DELAY. Mr. Durham, the proposed fuel tax will obviously make a huge negative impact on the airline industry. In fact, ATA has estimated that it will be an additional tax burden of $1.4 billion to $2.1 billion when fully implemented. I also understand that virtually all of the airlines have come out in opposition to the proposal except American. This seems to me to be one of those few issues where the entire airline industry can unite and act together.

Why hasn't American joined the rest of the industry in vigorously opposing it?

[American Airlines response follows:]

We believe that it is essential that the federal deficit be reduced. Without a healthy and robust economy, all businesses will be in jeopardy. We also recognize that everyone in the United States must contribute to reducing the deficit. However, it is also important to consider the effect of individual industries of incremental taxes and the corresponding impact on the economy at large. The airline industry and its users already have a disproportionately high tax burden—fees, excise taxes, property taxes, alternative minimum taxes, etc. Since the airline industry is the core of the immense travel and tourism business, which employs an estimated 8.8 million—more than 7.2% of all the jobs in the United States—the United States will not have an improved economy without a healthy airline industry. Therefore, it is only reasonable to ask that certain tax issues particularly adverse to the airlines be mitigated.

Because of the impact of travel and tourism on the economy, and since it generates a $9.4 billion surplus in the nation's trade balance, imposition of major new taxes—including the BTU tax—may disproportionately impact the nation's economic recovery. This is particularly true considering the already weakened condition of the industry. It was for this reason that we believed modifications should be made to the Administration's tax package that would lessen the impact on our already heavily taxed industry. Since we may not be successful in obtaining those badly needed adjustments and since the Administration's tax package includes relief for a number of industries—including the aluminum industry and the renewable energy industry—we believe it is time to exempt carriers from the BTU provisions. We also think that modifications to the Alternative Minimum Taxes and meal deductibility as it impacts meal expenses for flight crews be adopted promptly.

NORTHWEST AIRLINES NOL PROPOSAL

Mr. DeLay. Mr. Seiden, you claim that your proposal to offset net operating losses against income tax liability is revenue neutral. Please explain your conclusion.

[Northwest Airlines response follows:]

Over the short to medium term, the NOL offset idea is essentially revenue neutral. NOLs are presently preserved in the Internal Revenue Code, in tax parlance, carried forward, for up to fifteen years after they are incurred in an unprofitable tax year. At such time that the company that incurred the NOL returns to tax profitability in any of those subsequent fifteen years, the NOL thus permissibly offsets income up to the amount of the NOL, and offsets income tax liability that otherwise would apply in that future year. In other words, the federal government by operation of its existing tax code reduces the revenue it otherwise would have realized but for the carrying forward of the NOL.

Northwest's proposal is to permit airlines who pay enormous sums in transportation excise taxes to use those NOLs now, when they need the tax relief, as an offset to excise taxes paid in 1992. Use of the NOLs now would use them up, and make them no longer available to offset future income tax liabilities. Therefore, the airline taking advantage of this program starts its new tax year with little or no NOL and thus returns to tax profitability much earlier than if it had used the NOLs in those future years as an offset to income tax liability. The program is revenue neutral; it merely shifts the time when a valuable tax attribute is accessible to the taxpayer.

Mr. DeLay. Is an exemption of the excise tax proposal fair to all airlines?

[Northwest Airlines response follows:]

This NOL offset proposal is fair to all airlines. Today, airlines have whatever NOLs they have, and when they return to tax profitability, those NOLs will be available as an offset to future income tax. If one airline has only a small NOL position, or no NOLs at all, that airline some day will become a taxpayer after it exhausts its NOLs; other NOL airlines today might still have available an NOL deduction in the future. No one ever has suggested that this is unfair; in fact, that is present law. Our proposal merely accelerates the time when all airlines can access their NOL deductions.

Mr. DELAY. Does it favor one over the others?

[Northwest Airlines response follows:]

For the reasons stated above, it does not favor one airline over others. On the other hand, second tier carriers, who need financial assistance the most, have the largest NOL positions among the carriers, so they would reap the largest share of immediate benefit although they might well be limited in their refund amounts if they did not pay the maximum amount of 1992 excise taxes than their NOLs would otherwise equate to.

BANKRUPT CARRIERS

Mr. DELAY. Do you feel that the current airline crisis is primarily related to the behavior of bankrupt carriers?

[Northwest Airlines response follows:]

We do not believe the current airline crisis is primarily related to the behavior of bankrupt carriers. We rather believe it is a function of the Persian Gulf war, recession which led to reduced demand, and excessive taxation and regulation.

PASSENGER FACILITY CHARGES

Mr. DELAY. To all of you, I have heard allegations about the effects of PFCs at hubs. It appears that airlines with PFCs at their hubs are being forced to eat the PFCs imposed on connecting passengers. As I understand, this is because competing hubs often do not impose the charges.

I am concerned about the competitive effects of this problem. Can you explain it to me?

[ATA response follows:]

The equation is really quite simple. Let's assume you wish to travel from New York to Los Angeles, with a connection, and the fare is $100. Let's further assume, for simplicity's sake, that neither New York nor Los Angeles imposes a PFC. You call a travel agent, and discover that Hub A imposes a $3.00 PFC, while Hub B does not impose a PFC.

If you choose to travel via Hub B, you fare would be $100.00. Under a strict interpretation of the PFC regulations, your fare over Hub A should be $103.00—$100 fare plus the $3.00. However, the airline serving Hub A, because it wants your business, will show a fare of $97.00, with a $3.00 PFC, equalling $100.00—exactly the same amount you would pay over Hub B. In essence, then, the airline serving Hub A is losing $3.00 in fare in order to keep your business.

[Northwest Airlines response follows:]

Northwest has PFCs at all three hubs, Detroit, Memphis and the Twin Cities. This means that for a connecting passenger from Boston to Portland, it will cost $6 more to fly round trip on Northwest via Minneapolis or Detroit than on Delta via Cincinnati or Atlanta, neither of which have PFCs. Most customers will not pay this extra money just for the pleasure of connecting on one of Northwest's hubs. Most travel agents have computer programs that automatically book away from higher priced routings, and many corporate travel departments strictly manage pricing to ensure lowest cost routings. Accordingly, as long as customers can route via non-FPC impacted hubs, a carrier like Northwest has no choice but to "eat" the PFC to avoid losing customers.

[American Airlines response follows:]

PFCs are another example of fees and taxes which must be absorbed by the carriers because we are unable to pass these charges on to our passengers through higher ticket prices. The air carrier industry is very competitive. In most markets, passengers can choose between a number of different carriers throughout the day.

Therefore, carriers must match the lowest fare in that particular market. Computer Reservation Systems (CRSs) contain complete information on the schedules and fares of all airlines offering service in a given market. Since travel agents can offer consumers near perfect information on all travel options through CRSs, any carrier charging a higher fare in a particular market will lose passengers.

It is for this reason that carriers must often absorb costs or match fares even at levels that do not meet costs. This is a primary reason why bankrupt carriers have had such a devastating impact on the health of the entire industry. Since they are not required to meet all of the expenses of the healthy carriers, they can offer significantly lower prices. If we don't meet the lower prices, we would lose even more money than we do with the lower fares.

It is for this same reason that a carrier will absorb a cost imposed on it at a particular airport that is not imposed at other airports. We must emphasize that PFCs are only one type of cost imposed at airports. Some airport authorities impose high lease and landing rates. Those type of costs would also have to be absorbed. We do note that in some cases, carriers receive significant subsidies from local and state governments which more than offset these costs.

It is essential that Congress closely review PFC authority. In many cases, some airports are proposing to use PFCs to fund off-airport projects and are being used to develop facilities for which there is no demonstrable need. We applaud the actions of Chairman Carr and this Committee for taking the lead on this issue.

REGULATORY BURDEN

Mr. DELAY. It appears to me that the airlines are facing a large regulatory burden that seems to forever grow and grow.

What would you, the airlines, think of transforming the regulatory process into a pay-as-you-go system? For example, each time a new regulation is imposed on the industry by Congress or DOT, the cost to the industry would have to be fully calculated. Then, to offset the additional cost, a previous regulation with a similar price tag that has outlived its usefulness or is just frankly not worth what it costs would be eliminated. We would essentially have a budget neutral regulation and cost system.

Could you comment?

[ATA response follows:]

Your proposal certainly deserves serious consideration. Far too often regulatory requirements are heaped, one on top of another, without any consideration for their cumulative impact. There are a few points I would like to make with regard to your proposal and an observation or two about the overall excessive cost burden of the regulatory process.

An agency could select a rule to repeal in which the sunk costs offset the costs of the new regulation. Too often the substantial costs of a regulation are initial costs, not ongoing costs. As a result, an agency could come up with a $500 million rule, propose to eliminate a previously imposed $500 million rule, but since the carriers have already spent $500 million for the rule proposed to be eliminated, the carriers would end up spending the same $1 billion as if the first rule were not repealed.

This is the case right now with FAR Part 107.14, Airport Access Control Systems. The airlines have already sunk $500 million into this questionable rule. If the FAA came up with a new $500 million rule and repealed the initial rule, there would be no recovery of the first $500 million; and any savings would come out of the anticipated costs for further compliance with the rule.

I would also like to point out that the quality of the regulatory cost analysis engaged in by the agencies with which the airlines are concerned is abysmal. (In the case of the aforementioned 107.14, the FAA estimated the costs at $168 million, and we have already spent $500 million and we anticipate spending up to $300 million more before we are in full compliance with the rule.) In any case, low ball estimates are put forward in order to evade executive branch requirements that the Office of Management and Budget review higher cost regulations. We have little confidence that such practices would not continue unabated were the regulatory offset concept adopted.

To remedy these problems, cost estimates should be a component of regulations, subject to judicial review just as the regulations themselves. And if the regulatory cost analysis is deficient the rule should be stricken.

If the regulatory cost analysis passes judicial muster, but its implementation ultimately results in costs greater than those estimated by the regulator in the course of the rulemaking process, than consideration should be given to the additional cost burden of the regulation being imposed on the Federal government.

Furthermore, the Federal personnel system suffers from a lack of accountability. Political employees as well as civil service employees with substantive responsibility for rulemaking should be held accountable for their errors which have significant cost impacts on travelers, airline employees, and airlines. At the same time as thousands of airline employees have lost their jobs, seen their salaries cut, or their benefits reduced as a result of intolerable government cost burdens, those in the executive branch who have foisted these cost burdens on the public do not share in the suffering. As a matter of fact they just keep pouring it on.

[Northwest Airlines response follows:]

We would strongly support a pay as you go system for imposition of new airline regulations. Today, regulators have no responsibility to determine how airlines will pay for new regulations. Given our staggering losses, we clearly cannot afford to pay for new regulations, no matter how worthy they may be. The suggestion that for every new regulation introduced, an old one of equal value would have to be scrapped would be a very healthy way of achieving cost-benefit balance.

[American Airlines response follows:]

Unjustified and outdated regulations have imposed enormous costs on the air carrier industry. Government regulators have failed to conduct adequate cost/benefit analysis for proposed regulations. The same can be said for regulations imposed by Congress. As a result, regulations often create costs that are totally disproportionate to the public benefits they were intended to address. Moreover, the government rarely reviews existing regulations to eliminate unnecessary burdens or excessive costs.

Let me mention two examples. Government regulation requires carriers to randomly test employees for drug usage at a required rate of 50%. Although years of experience show that the positive testing rate of airline employees is very low, DOT has yet to act on petitions that have been submitted over the past few years asking that the testing rate be lowered to 10%. This small and simple regulatory change would save the industry millions of dollars each year.

Another regulation that imposes significant costs on the industry is the high density rule. Established in 1968 as a temporary rule to limit congestion at the nations busiest airports, it still limits total air carrier operations and dictates the size of aircraft that can be utilized at four airports—O'Hare, Washington National, LaGuardia, and Kennedy. Despite the expenditure of billions of dollars on the air traffic control system since 1968, the total number of air carrier operations authorized at those airports remains at or below 1968 levels. There are no other airports in the world with similar restrictions. For the past several years, American has attempted to obtain a regulatory change that would allow the size of aircraft authorized to be used in commuter slots at O'Hare to be increased from 75 to 110. Although the proposal has received significant community support and the FAA has admitted that it would have no impact on the ATC system (they admit delays are down), there is still no final rule. By all estimates, a change in the rule as proposed, would result in the creation of approximately 1,000 jobs with an annual payroll value of $95 million and a total economic impact of over $280 million in the Chicago area alone. Moreover, the rule change has a potential annual benefit of $40 million to American. At a time when the industry continues to lose money, these types of regulatory changes are essential if we are to return to profitability.

There is another provision of the high density rule that penalizes U.S. carriers, our employees and communities throughout the country. Under the rule, slots are withdrawn from U.S. carriers at O'Hare for any proposed new or additional operation submitted by a foreign carrier. Every time a slot is withdrawn from a U.S. carrier, a flight to a U.S. city must be cancelled. DOT meets the demands of foreign carriers even if the carrier's home country does not provide slots to U.S. carriers on an equal basis. American Airlines joined Federal Express in filing a recent petition with the DOT seeking to change this discriminatory rule. (A copy follows). DOT has not yet responded to the petition.

We believe that government agencies should be required to undertake a thorough evaluation of existing regulations and eliminate all of those that are not cost benefit justified. Furthermore, no new regulations would be proposed unless a detailed cost benefit analysis is performed and subjected to public review.

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C.

Petition for Rulemaking to Amend :
the High Density Traffic Airports :
Rule to Limit Withdrawal of :
Domestic Slots for Foreign Carriers :

DOCKET 27160

Petition of American Airlines, Inc. and Federal Express Corp. to Modify Subpart S of Part 93 of the Federal Aviation Regulations

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February 10, 1993

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C.

Petition for Rulemaking to Amend :
the High Density Traffic Airports :
Rule to Limit Withdrawal of :
Domestic Slots for Foreign Carriers :

Petition of American Airlines, Inc. and Federal Express Corp. to Modify Subpart S of Part 93 of the Federal Aviation Regulations

American Airlines, Inc. and Federal Express Corp. (Co-Petitioners) hereby petition the Federal Aviation Administration for rulemaking to amend 14 CFR 93.213(c) and to 93.217(a)(1) and (a)(10) to limit the ability of the FAA to withdraw slots from U.S. carriers -- forcing cancellation of domestic service -- to satisfy foreign carriers' demands for slots.

For 23 years, operations at O'Hare International Airport and three other airports -- Washington National, LaGuardia and John F. Kennedy International -- have been controlled by Subparts K and S (the "high density rule" or "HDR") of 14 CFR Part 93. Carriers need a slot for each arrival and departure at a high density airport.

Under the HDR, slots for international operations at O'Hare are provided to foreign carriers even if slots must be withdrawn from a domestic operator. No other government in the world provides slots to a U.S. carrier under a similar procedure; instead, U.S. carriers are routinely denied access to competitively required slots at foreign airports.

The number of air carrier slots has not been increased at O'Hare in 25 years. Therefore, these pro-foreign carrier regulations significantly penalize U.S. airlines operating at O'Hare, our employees, and residents of U.S. cities who deserve service to O'Hare.

This petition asks that foreign carrier slot holdings at O'Hare be modified and certain U.S. and foreign carriers no longer be able to obtain slots under the HDR as follows:

For slots allocated prior to the effective date of this amendment --

> Slots will be withdrawn from foreign carriers[1] that have received slots under Section 93.217 unless DOT certifies that the carrier's home country has provided and continues to provide slots to U.S. carriers under a procedure equivalent to those set forth in that Section.

For slots to be allocated after the effective date of this amendment --

> No slot will be withdrawn from a U.S. carrier under 14 CFR, Section 93.217 for international operations by --

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[1] This petition does not ask that slots allocated to U.S. air carriers be withdrawn since that issue was ruled upon by the Department in Amendment 93-61 (55 F.R. 53238, January 27, 1991)

a. A U.S. carrier that is owned more than 10% by a foreign carrier, or

b. A foreign carrier unless

    (i) DOT certifies that the foreign carrier's home country provides slots to U.S. carriers under procedures that are not more restrictive than 14 CFR Section 93.217; and

    (ii) The foreign carrier does not own more than 10% of the voting stock of any U.S. carrier.

BACKGROUND

In 1985 the Department amended the HDR to guarantee the allocation of slots for international operations at high density airports (Amendment 93-49, 50 F.R. 52195, Dec. 20, 1985). These rules require the FAA to withdraw slots from U.S. carriers to meet schedule demands of all foreign carriers. In issuing this provision, the Department said it expected that foreign governments would establish similar provisions allowing U.S. carriers to obtain slots at their airports. In response to Notice of Proposed Rulemaking 84-6 which proposed these requirements, both the Departments of Justice and State stated that the rules would not violate bilateral agreements if foreign carriers were given a fair and equal opportunity for available slots. Nevertheless, DOT went beyond those comments by adopting a regulation that requires withdrawal of slots from domestic operators to accommodate foreign demands.

When the HDR rule was issued in 1985, it required withdrawal from domestic operators at both O'Hare and Kennedy airports to satisfy demands for all international operations. In Amendment 93052 (51 F.R. 21708, June 13, 1986), the Department decided that it would not be necessary to withdraw slots at Kennedy. In explaining this decision, it stated:

> It is generally accepted throughout the rest of the world that requests by operators for additional slots, including schedule changes, will be accommodated if there are unutilized slots, but that existing operating rights will not be cancelled.

Although conceding that the general practice was not to withdraw slots to meet slot requests, the Department left in place withdrawal provisions at O'Hare.

In December 1990, DOT amended the rules again. This amendment required that any carriers with 100 or more slots at O'Hare utilize its domestic slots to add foreign operations. Slots continue to be withdrawn from domestic operators -- including American -- for any request by a foreign operator. However, if American wants to match that foreign competitor's operation, we have to cancel a domestic operation to generate the needed slots.

In that 1990 rulemaking, the Department rejected the suggestion that it suspend all withdrawals to meet foreign carrier demands by stating:

> Even if domestic slots are not withdrawn at foreign airports, U.S. airlines are expected to receive the slots necessary to sustain an effective competitive presence in foreign markets. Pursuant to Section 93.217(d), the Office of the Secretary of Transportation retains the right not to apply the provisions of Section 93.217 to a foreign operator

> whose country provides slots to U.S. carrier and commuter operators on a basis that is more restrictive than that provided by U.S. slot allocation rules. The situation in foreign markets is being carefully monitored by the Office of the Secretary, and if the ability of U.S. operators to compete effectively in foreign markets is compromised, that provision may be invoked.

The HDR does not limit the number of slot requests that a foreign carrier can submit. It is not unusual for a slot to be withdrawn and then returned for part or most of the schedule season. For example, on December 4, 1992, the FAA returned six slots -- for the period December 17, 1992 through April 23, 1993 -- that had been withdrawn for the Winter 1992-93 season. But by the time these slots were returned, American's schedules had already been disrupted, forcing the cancellation of a number of services. The HDR does not prevent a foreign carrier from doing this season after season, but only says that the Office of the Secretary reserves the right not to apply the provisions of this section to any foreign carrier of a country that provides slots to U.S. carriers on a basis more restrictive than provided by the subpart. To date, the Office of the Secretary has failed to take any action -- despite the fact that no country provides slots to U.S. carriers as freely as the U.S. government does to foreign carriers.

DISCUSSION

Slots Should Not Be Withdrawn For Foreign Carriers From Countries with Restrictive Slot Rules

At many airports around the world, U.S. carriers cannot obtain new slots, nor can we move from one time period to another. No foreign country withdraws slots from its carriers for U.S. carriers. At some foreign airports, U.S. carriers are forced to operate the same flight number at different times on different days of the week. In contrast, foreign carriers obtain slot authority at

O'Hare in the specific 30-minute time frame requested. After seven years of withdrawing slots from U.S carriers and handing them to foreign carriers, restrictions faced by U.S. carriers outside of the U.S. have not lessened. In the last two years, it has become even more difficult for U.S. carriers to obtain slots at airports in numerous foreign countries, including U.K. and Japan. Nonetheless, DOT has left the withdrawal provisions in place at O'Hare and continues to provide slots to carriers from countries that have treated U.S. carriers with disdain.

There is no question that the U.S. HDR slot allocation/withdrawal procedures are unique. In its answer filed in response to American's petition for suspension of British Airways' Miami-London permit authority (Docket 48469), BA said:

> Indeed, the Department's rule granting preference to international flights at certain U.S. airports is the exception, not the rule (p. 9).

In the same answer, British Airways asserted that the allocation procedures in place at Heathrow are consistent with most other airports because they comply with IATA scheduling procedures. The question of whether the Heathrow procedures are consistent with IATA rules is not material. What is material is that neither the IATA guidelines nor the slot procedures followed in the U.K. are equivalent to the U.S. procedures.

As clear as BA's statements are as to the U.K.'s attitude on providing slots to U.S. carriers, they are not as startling as comments made by U.K. government officials. In a December 31, 1992, letter to Paul L. Gretch, Director of the Office of International Aviation at DOT, R.J. Griffiths, Counsellor of the British Embassy in Washington, D.C. stated that "The British Government does not participate in the allocation of slots." Similarly, in U.K. Diplomatic Note #41, the U.K. said:

> Her Majesty's Government ("HMG") would draw the attention of the Department of State to the fact that HMG plays no role in the allocation of slots for airlines at airports. The allocation of slots at Heathrow Airport is carried out independently by Airport Coordination Limited, a private company established to administer slot coordination...[2]

Thus, the U.K. denies any responsibility for slot allocation at London airports and admits that those decisions are controlled by U.K. carriers. Under the Constitution of the Scheduling Committee established by Airport Coordination, Limited, voting is based on the number of slots held by each airline. BA, in its Answer in Docket 48469, acknowledged that its influence over Scheduling Committee activities is based on "significant slot holdings."

While our Government continues to withdraw slots from U.S. carriers to satisfy foreign carrier demands, the U.K. Government -- and other governments -- leave airport slot decision making to a group controlled by our competitors. How can this not be more restrictive than the procedures in Section 93.217?

It is time for the Department to remedy this disparate and anticompetitive treatment. Under this petition, DOT would have an affirmative obligation to verify that slots are only allocated to carriers from countries that provide slots to U.S. carriers on an equivalent basis. Moreover, DOT would be required to review all allocations made since the international slot allocation procedure was established in 1985 and revoke those allocations made to carriers from countries that have rules more restrictive than those of the U.S.

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[2] Airport Coordination Limited (ACL) is controlled by British carriers, primarily British Airways. BA initially founded ACL as a wholly-owned subsidiary to take on responsibilities for slot allocation. As of May 27, 1992, ACL was established as an "independent" company jointly owned by nine (now eight, following BA's takeover of DanAir) U.K. airlines, in which BA -- with approximately 40% of Heathrow slots -- is the dominant party.

Slots Should Not Be Withdrawn For A Foreign Carrier Owning More than 10% of a U.S. Carrier

Under Section 93.217, a foreign carrier can demand slots at O'Hare -- and DOT will withdraw slots from domestic carriers -- even if the foreign carrier partly owns and/or controls a U.S. carrier that directly competes with the carrier losing slots. The Department should not permit such anticompetitive behavior.

Under 14 CFR 93.213(c), an air carrier with more than 50% ownership or control of another carrier is considered to be a single air carrier. As confirmed in recent DOT proceedings, a foreign carrier can own much less than 50% of a U.S. carrier and still direct international route decision making. A carrier with more than 10% of a U.S. carrier has other options. For example,

> KLM, with ownership of 49% of Northwest, could use NW's 60 slots at O'Hare or obtain additional ORD slots by trading USAir's large slot holdings at other HDR airports, or it can operate at Northwest's other hubs -- Minneapolis/St. Paul or Detroit.

> Air Canada, with a 27.5% ownership of Continental, can utilize CO's 36 slots at O'Hare, or obtain additional ORD slots by trading CO's large slot holdings at other HDR airports, or it can operate at

CO's hubs -- with international service -- at Houston, Denver, and Newark.

> If BA were allowed to purchase 25% of USAir it could use USAir's 36 slots at O'Hare, or obtain additional ORD slots by trading USAir's large slot holdings at LaGuardia (39.3% of peak slots) and National (46.6% of peak slots), or it could operate at USAir's other large hubs -- Pittsburgh, Charlotte, Baltimore, or Philadelphia.

O'Hare is the only hub airport in the country regulated by the Federal government. It is time for DOT to recognize that O'Hare carriers must compete with carriers at non-regulated hubs. Therefore, every time KLM, Air Canada, or any other foreign carrier, claims a slot at O'Hare, not only are they given new international competitive opportunities, but they also weaken the ability of O'Hare's carriers to compete with the U.S. carriers that are affiliated with these foreign carriers.

There is no reason why the Department should provide a foreign carrier -- that has ample opportunity to establish international operations at multiple hubs throughout the country and the resources of a U.S. carrier it partially owns or controls -- slots at O'Hare by withdrawing them from a U.S. operator. To do so is inconsistent with the establishment of a fully competitive system, and should be stopped.

CONCLUSION

As President Clinton and Vice-President Gore stated in *Putting People First*,

> When our workers and firms do their part to be competitive, we must have an administration that does its part to ensure that we have open markets for their goods and services. We need a new trade and competitiveness program. A Clinton-Gore Administration will stand up for American workers by standing up to countries that don't play by the rules of free and fair trade. Given a chance, American farmers, workers, and businesses can outcompete anybody.

In spite of the blatantly protectionist conduct of foreign governments acting in concert with our foreign airline competitors, DOT rules continue to penalize U.S. carriers at O'Hare for the benefit of these same foreign carriers. It is time for DOT to recognize that worldwide slot allocation practices do not reflect free and fair trade and to immediately amend the slot rules as proposed in this petition. As President Clinton said -- our Government should stand up for U.S. carriers and workers and end this slot giveaway.

Respectfully submitted,

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February 10, 1993

Summary of Petition for Rulemaking

Pursuant to 14 C.F.R., Section 11.25, American Airlines, Inc. and Federal Express Corp. have petitioned the Administrator of the Federal Aviation Administration for rulemaking to modify Subpart S of Part 93 of the Federal Aviation Regulations -- 14 C.F.R. 93.213 an 93.217. Under the petition, the FAA would withdraw slots from foreign carriers that have received slots at O'Hare unless DOT certifies that the carrier's home country has provided and continues to provide slots to U.S. carriers under equivalent procedures. The petition also asks that FAA refrain from withdrawing slots from a U.S. carrier that is owned more than 10% by a foreign carrier, or a foreign carrier unless (i) DOT certifies that the foreign carrier's home country provides slots to U.S. carriers under procedures that are not more restrictive than 14 CFR Section 93.217; and (ii) the foreign carrier does not own more than 10% of the voting stock of any U.S. carrier.

USAIR/BRITISH AIRWAYS MERGER

Mr. **Coleman**. Mr. Durham, please describe the potential impact upon Texas in terms of jobs and air service if the USAir/British Airways deal is approved by DOT.

[American Airlines response follows:]

Since the beginning of the decade, the air carrier industry has lost $10.5 billion. American alone has lost approximately $1 billion. As a result of these dismal economic results: most of the industry's bonds have been downgraded to non-investment (junk) bond status; American has reduced its five-year capital spending plan by $8 billion. This involves scaling down our fleet plan by 91 aircraft. This cutback means that there will be about 14,000 fewer potential jobs at American.

American has delayed deliveries of eight Boeing aircraft and has grounded 31 DC-10 aircraft. This translates into another 5,000 fewer potential jobs at American.

In November 1992, American laid off approximately 300 management employees and an additional 300 people retired early. Last week, American laid off 500 maintenance workers.

Unfortunately for all of us, the industry's economic outlook for 1993 is only marginally better than that of recent years. Thus, the industry is likely to experience additional layoffs and downsizing.

When DOT considered the original BA/USAir proposal, we provided information to the Department showing that approval of the code sharing agreement between the two carriers would cost the US airlines (other than USAir) $400 million.

DOT's approval of a code sharing arrangement between the two carriers—with no reciprocal equal authority for U.S. carriers—will draw traffic away from American and other U.S. carriers to the exclusive benefit of British Airways. Passenger survey data shows that passengers prefer to travel on a single carrier rather than having to travel on two separate carriers. Since American does not have authority to conduct operations beyond London, we anticipate a large number of passengers will opt to fly on BA whenever they have plans to go beyond London.

While it is too early to determine the exact cost of the BA/USAir merger, we believe that our original $400 million annual estimate is accurate. The resultant impact on American and Texas will be substantial. Not only will passenger loads decrease forcing cutbacks at a number of stations, but we may be forced to further reduce staffing at our maintenance facilities including our new Alliance facility in Fort Worth. Unfortunately, the Department seems ambivalent to the likely economic consequences of this decision.

Secretary Peña has stated that if the new UK-US bilateral—providing for open skies—is not negotiated within one year, then the BA-USAir agreement will not be extended. We trust that both DOT and DOS will meet that commitment.

Mr. **Coleman**. The proposal of British Airways/USAir is now divided into three phases. Does this make the transaction any less harmful than the one that President Clinton opposed during the election campaign?

[American Airlines response follows:]

No! The most devastating aspect of the BA-USAir alliance is the code-sharing arrangement on USAir's domestic system. The Department's authorization of the code-sharing arrangement provides those carriers with an enormous benefit that we and other U.S. carriers cannot match. Neither DOT or DOS seem to be in any rush to level the playing field or to provide U.S. carriers with expanded authority.

CLOSING REMARKS

Mr. **Carr**. With that, I just want to thank you all. I think it has been a learning experience for all of us. I know that a lot of what was discussed here today is going to come up again in a very helpful way, hopefully, when we have the FAA before us on their fiscal year 1994 budget request.

I thank you for the time and attention you have given this Committee. This hearing is adjourned.

Thursday, April 15, 1993.

INTELLIGENT VEHICLE HIGHWAY SYSTEMS

FIRST PANEL OF WITNESSES

THOMAS A. HORAN, PH.D., SENIOR FELLOW, INSTITUTE OF PUBLIC POLICY, GEORGE MASON UNIVERSITY

EDWIN ROWE, GENERAL MANAGER (RET.), LOS ANGELES DEPARTMENT OF TRANSPORTATION

RICHARD P. BRAUN, DIRECTOR, CENTER FOR TRANSPORTATION STUDIES, UNIVERSITY OF MINNESOTA

FREDERICK T. TUCKER, EXECUTIVE VICE PRESIDENT, MOTOROLA, INC.; AND GENERAL MANAGER, AUTOMOTIVE AND INDUSTRIAL ELECTRONICS GROUP (AIEG)

GARY DICKINSON, PRESIDENT AND CEO, DELCO ELECTRONICS CORPORATION

Opening Remarks

Mr. Carr. The committee will come to order and we will begin our hearing.

I probably should introduce myself. I normally don't have to do that when we are in our Committee hearing room on Capitol Hill, but since we are in a new venue today, my name is Bob Carr. I am privileged to be the Chairman of the Transportation Appropriations Subcommittee. I am joined by the Ranking Member of the Committee, Frank Wolf, a Congressman from just across the Potomac River. We are glad to come here today to hold a formal hearing about intelligent vehicle highway systems in the United States.

We are pleased to do it in conjunction with the third annual convention of IVHS America. We thank the officials and the staff of IVHS America for accommodating the Subcommittee as it holds its hearing in the middle of a very busy convention schedule.

We could not afford to miss the unique circumstances offered by viewing the many exhibits and displays here at the convention and by talking with recognized experts in the field about smart highways and smart vehicles that operate on those smart highways.

Personally, I have seen many of the exhibits already this morning and I am very impressed with the diversity of ideas and technologies that have been represented. IVHS is truly an exciting area that holds the promise of changing the way we travel and the way we think about traveling in America.

As with most large undertakings, there is some risk involved. To be successful, the IVHS program must incorporate user-friendly technologies which are not too expensive to operate and to maintain. Products and technologies should be used because there is a need and a market for them, not because they are available.

The program must also be integrated in an overall manner that maximizes the benefits of all individual projects and technologies.

The challenges are formidable but the potential payoffs are enormous. Given the condition of our Nation's transportation system and the budget crunch that we face today, we really don't have a good alternative to the IVHS approach. We will not be able to build our way out of the congestion and air pollution problems that we have. We have to exploit the technologies available today and to develop techniques that we will need in the future.

Today, we are going to hear testimony from experts of broad backgrounds on transportation policy and IVHS issues. We have representatives from local, county and State governments with us today. And we also have people from corporations involved in the manufacturing of IVHS systems in addition to witnesses from academia and commercial users from across the country. The broad perspective offered by these individuals should add considerably to the Committee's knowledge on IVHS matters.

I would like to point out today that because the room is scheduled to be used after this hearing that I am going to be a little rougher than normal on witnesses because we have to keep to a schedule. I would ask that all of the witnesses submit their prepared statements for the record and then briefly summarize. And without further ado, I would like to introduce my good friend and colleague from Northern Virginia, to make whatever observations he would like to make.

Introduction of First Panel

Mr. Carr. Passing then, we will proceed with the first panel. I am not going to make extensive introductions, particularly to this audience because most of you know one another. On our first panel is Mr. Edwin Rowe, former General Manager of the Los Angeles Department of Transportation; Dr. Thomas Horan, Senior Fellow at George Mason University; Dr. Richard Braun, Director, Center for Transportation Studies at the University of Minnesota; Mr. Frederick Tucker, Executive Vice President of the Motorola Corporation; and Mr. Gary Dickinson, President and CEO of Delco Electronics.

Welcome to the hearing. Dr. Horan, why don't we start with you.

Statement of Thomas Horan

Dr. Horan. Thank you very much.

Good morning, Mr. Chairman, Mr. Wolf. It is a pleasure to be here with you this morning.

My name is Tom Horan. I am a Senior Fellow at the Institute of Public Policy at George Mason University. Prior to joining the university in 1992, I was a senior analyst with the U.S. General Accounting Office in Washington. Through the course of these experiences, I have had several opportunities to review, study, and remark upon the national IVHS program. I appreciate the opportunity you are providing me this morning to share some of my observations with the Committee.

As an opening speaker here, I believe that I can help cite some of the broad challenges that await the IVHS program, and we will hear how the challenges are being met through the course of this morning. Much of what I have to say can be found in the papers, reports, and proceedings that my colleagues and I at George Mason have produced. The most pertinent to this testimony is a paper entitled Toward Adaptive IVHS: The Role of Impact Assessments in Guiding the Development of Advanced Transportation Technologies. I would at this time request this paper, along with my written testimony, be made a part of the record.

Mr. Carr. Without objection.

Mr. Horan. The focus of my comments this morning is on the pressing need of developing credible evaluations that can guide the national IVHS program. The central issue is the quality of information available to the Congress, this Subcommittee, and the Nation on how and where IVHS can be most beneficially employed. My comments suggest three aspects of this issue.

First, evaluations are the source of much empirical information on IVHS. Thus, we must ensure that they produce information needed by decision-makers at the national level.

Second, we must broaden the range of topics on which IVHS information is being produced. I think this is particularly important with regard to the environmental aspects of IVHS.

Third, there are a host of nontechnical, or otherwise called institutional, issues that could affect the success of IVHS, and the upcoming nontechnical report to Congress should be reviewed as a first installment of continuing attention to this issue.

Let me start with the issue of IVHS evaluations. The development of reliable empirical information on IVHS benefits and costs should be a central focus. As you know, IVHS could make significant contributions in a number of important areas; improving mobility, safety and the like. But it is vital that these gains be documented in a credible manner as the program proceeds.

While I was on staff at GAO, we conducted a review of the empirical support for IVHS. As part of that review, we specifically examined the extent to which empirical data existed in IVHS. While there was a strong consensus that IVHS would have a positive effect on the surface transportation system, we found that for the most part that these were based on model estimations or more basic projections. Thus, we recommended to Congress that specific requirements be included in the IVHS portion of ISTEA to ensure the development of IVHS performance data through the course of the operational field tests.

We were pleased to see that these recommendations were incorporated and that the Department of Transportation is developing guidance for specific tests and conducting related research. Nonetheless, much remains to be done. Mechanisms are needed to ensure that the results of different operational tests can be synthesized to an overall assessment of IVHS performance.

From my discussions with departmental staff, I believe they are aware of and are beginning to address this need. The Federal Transit Administration has recently undertaken a project to develop an evaluation framework to guide the public transportation demonstrations. Notwithstanding, I believe that my principal concern remains that the operation of field tests could be getting ahead of the ability to provide guidance on how it all fits together.

We are recognizing that the operational tests are important for a variety of reasons: To test different technologies or to test alternative public and private sector arrangements. However as I mentioned, they are also important to the development of an empirical basis for the national program. To my knowledge, we have yet to achieve this overall national linkage. I might add this is a high priority research recommendation by IVHS America and was also a major conclusion of a recent workshop on this issue.

My second point pertains to diversified IVHS research portfolio. IVHS consists of various bundles of technologies which aim at different public and private sector goals and just as one would seek to have a diversified investment portfolio, the national program should ensure sufficient diversification so that a range of approaches and goals can be attended to.

The IVHS program is becoming more diverse. In the last two years both the advanced public transportation systems and the advanced rural transportation systems have achieved acronym status. They back a part of the program. While much of this diversity can be responsive, stewardship is needed at the policy level to ensure that a broad array of goals are attended to.

As a primary example of this, I would note so far the need for, and so far relative absence of, research on the clean air implications of IVHS. The Clean Air Act amendments of 1990 have fundamentally affected how transportation decisions are made. In light of the fact that close to 100 metropolitan areas are in nonattainment of these clean air standards, the need to better understand the impacts of IVHS on air quality is obvious and pressing.

For this reason, George Mason recently cosponsored with the Department of Transportation and IVHS America, a national workshop on IVHS and air quality. Several points were raised in this workshop. For time's sake I won't go into them, but suffice it to say that a major conclusion was that the program should have some reorientation to ensure that data is being developed on this issue.

My third point pertains to the nontechnical assessments of IVHS. There are a variety of these nontechnical or institutional issues that could affect the course of IVHS. Recognizing the influence these factors could have, the Congress has requested a nontechnical report be delivered by December of 1993. As specified in the request, the report which is being prepared right now by the department will cover a variety of interests such as public and private sector partnerships, legal impediments, and privacy.

The composition of the panel this morning represents many of the institutional challenges that await IVHS. As my fellow panelist Ed Rowe has noted, IVHS requires unprecedented levels of coordination among public agencies as they seek to integrate their systems. I would add that this is particularly acute when attempting to provide a truly multimodal IVHS service. Additionally, IVHS places emphasis on public-private partnerships, and in this regard I will look forward to hearing the comments from the Motorola and Delco representatives on the panel.

In my written testimony, as well as the papers that I have provided you, we list what those areas are. Unfortunately, time restraint precludes me from briefing you on our research results.

The importance of continued congressional attention to these issues is my main point this morning. The report to Congress should be viewed as a point of departure for integrating nontechnical issues into the overall IVHS program. I would encourage this committee to take an active role in reviewing and acting upon the results in the nontechnical report, including soliciting views from a wide range of experts. While I have touched on a number of evaluation issues, it does not exhaust the possibilities. We can learn both from overseas and some of the modeling efforts that are being developed.

To conclude, let me close by saying that the IVHS program represents a bold and exciting initiative to bring the advances of communications and related technologies to serve the transportation system. Both the Congress, the Department of Transportation as well as IVHS America are to be commended for their leadership in initiating the program and undertaking such a broad range of activities there. It is no doubt that the Federal program has been a driving force for creating momentum for IVHS in this country. But it must stand the scrutiny of those who may not be enamored with either fancy technologies or strong Federal programs.

And the current six-year authorization represents a crucial opportunity to develop a sound track record for the program. While the Department of Transportation has initiated several activities that aim in this direction, I believe the program would continue to benefit from sustained congressional attention. I would submit that the quality of information directly serves this committee as it seeks to assess IVHS and serves a multitude of public and private sector interests and ultimately it serves the public interest in knowing what to do with IVHS.

At George Mason, we look forward to contributing our part to this goal. We have been grateful for the committee's support of our efforts in the past, and we will be glad to assist you as we move along in this beneficial, initial undertaking. Thank you very much.

Mr. CARR. Thank you very much, Dr. Horan.

[The prepared statement and biography of Thomas Horan follow:]

TESTIMONY

by

Thomas A. Horan, Ph.D.
Senior Fellow,
Institute of Public Policy
George Mason University

before the

House Appropriations Committee
Subcommittee on Transportation and Related Agencies

on the

National Intelligent Vehicle-Highway Systems Program

April 15, 1993

TESTIMONY BY
THOMAS A. HORAN, Ph.D.

"NATIONAL EVALUATION ISSUES IN INTELLIGENT VEHICLE-HIGHWAY SYSTEMS"

Good morning Mr. Chairman and distinguished members of the Committee. My name is Thomas Horan. I am a Senior Fellow with the Institute of Public Policy at George Mason University. Prior to joining the university in 1992, I was a Senior Analyst with the U.S. General Accounting Office in Washington, D.C.. Through the course of these experiences, I have had several opportunities to review, study, and remark upon the national program in Intelligent Vehicle-Highway Systems (IVHS). I appreciate the opportunity you have provided me this morning to share some of my observations with the Committee.

Before I begin, I would note that much of what I have to say can be found in the various papers, reports, and proceedings that my colleagues and I at George Mason have produced (see Attachment 1). The most pertinent to this testimony is a paper entitled "Toward Adaptive IVHS: The Role of Impact Evaluations in Guiding the Development of Advanced Transportation Technologies" (see Attachment 2). Mr. Chairman, I would request that this report along with my entire written testimony be made part of the record.

The focus of my comments this morning is on the pressing need to develop credible evaluations that can guide the national IVHS program. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA of 1991) has given a tremendous boost to IVHS research and testing. Moreover, these authorizations have been further supported through the annual appropriations of the Congress. Given this overall level of support for IVHS, it is imperative that useful information on IVHS effectiveness be produced as part of the national IVHS program.

The central issue is the quality of information available to the Congress and the nation on how and where IVHS can most beneficially be applied. My comments address three aspects of this issue:

> 1) Evaluations are the source of much empirical information on IVHS. Thus, we must ensure that they produce information that can inform decision-makers at the national level.
>
> 2) We must broaden the range of topics on which IVHS information is being produced. This is particularly true regarding the environmental aspects of IVHS.
>
> 3) There are a host of "non-technical" issues that could affect the eventual success of IVHS, and the upcoming "non-technical" report to Congress should be viewed as the first installment of continuing attention to this issue.

IVHS Evaluations

The development of reliable empirical information on IVHS benefits and costs should be a central focus of the national IVHS program. IVHS could make significant contributions in a number of important areas--for example, improving mobility and safety--but it is vital that gains in these areas be documented in a credible manner.

While I was at GAO, we conducted a review of the empirical support for IVHS (GAO, 1991). As part of that review, we specifically examined the extent to which empirical data existed on IVHS. While there was a consensus among the 38 major reports we reviewed that IVHS would have a positive effect on the surface transportation system, we found that for the most part these conclusions were not based on empirical field data. Rather, they were based on model estimations or more basic projections. Consequently, the report recommended that Congress establish specific evaluation requirements to ensure the development of IVHS performance data through the course of the operational field tests.

I was pleased to see that the evaluation recommendations were incorporated into the IVHS section of the ISTEA legislation, and that the Department of Transportation has taken an active role in developing evaluation guidance as well as conducting related evaluation research. However, much remains to be done. In particular, mechanisms need to be developed by which results of operational tests can be synthesized into an overall assessment of IVHS performance.

From my discussions with departmental staff, I believe they are aware of and beginning to address this need. For example, the Federal Transit Administration (FTA) has recently initiated a project to develop an evaluation framework for advanced public transportation demonstrations. Notwithstanding this effort by FTA, my principal concern is that the IVHS operational field tests could be getting ahead of the ability of the national program to provide guidance on how a particular test should fit overall national evaluation requirements.

I recognize that operational field tests are important for many reasons: to test various technologies, to test alternative public and private sector arrangements, etc.. However, as I mentioned in my introduction, they are also important to the development of empirical basis for guiding the national IVHS program. To my knowledge, this overall linkage has yet to occur. This is not just my personal assessment, but is also a high priority research recommendation by IVHS America and was a major conclusion of a recent national IVHS workshop (See IVHS America, 1992; IVHS America, 1993).

Diversified IVHS Research Portfolio

A second aspect of the quality of information is developing a purposefully diverse range of information on IVHS performance. IVHS consists of various bundles of technologies aimed at different public and private sector goals. Just as one would seek to have a diversified investment portfolio, the national program should ensure sufficient diversification of its research and testing portfolio so that a range of approaches and goals can be attended to. It is incumbent upon the IVHS research program to develop a diversified research portfolio and to develop feedback and tracking mechanisms which will facilitate further inquiry into promising areas and minimize the use of public funds in less promising areas.

The IVHS program is clearly becoming more diverse as it grows. For example, within the last two years both the advanced public transportation systems (APTS) and advanced rural transportation systems (ARTS) have been incorporated into IVHS. While much of this diversity can and should respond the natural program and market forces, stewardship is also needed at the policy level to ensure that a diverse array of public goals are being attended to, particularly when the use of public funds is involved.

An example is the need for--and so far absence of--research on the clean-air implications of IVHS. As this Committee is no doubt aware, the Clean Air Act Amendments of 1990 (CAAA of 1990) has fundamentally affected transportation program decision-making in many of the nation's metropolitan areas. In light of the fact that close to 100 metropolitan areas are in non-attainment of these clean-air standards, the need to better understand impacts of IVHS on air quality is obvious and pressing.

For this reason, George Mason recently co-sponsored a national workshop on IVHS and air quality.[1] Several important points were raised at the workshop. First, CAAA will require non-attainment areas to consider how IVHS can reduce (as opposed to induce) demand through transit and other measures. Second, the current transportation and air-quality modelling process is incapable of capturing the range of IVHS impacts on air quality. Third, the national program (particularly its operational tests) is not sufficiently attending to the air-quality aspects of IVHS, and several recommendations were made for strengthening IVHS tests and research in this area. Clearly, the development of IVHS in a manner consistent with national clean-air legislation is an issue that should be a central concern to transportation policy-makers.

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[1] The conference, entitled "National Workshop on IVHS and Air Quality" was held on March 29-30, 1993 in Diamond Bar, CA. Other co-sponsors included the U.S. Department of Transportation, California Department of Transportation, California Partners for Advanced Transit and Highways, and IVHS America.

Non-technical Assessments

Finally, there are a variety of "non-technical issues" that could affect the overall course of IVHS. Recognizing the influence that these factors could have over IVHS, the Congress has requested a non-technical report to be delivered by November, 1993. As specified in the request, it will cover issues such as public-private sector relations, legal impediments, education, and privacy.

The composition of the panel this morning exemplifies many of the institutional challenges that await IVHS. As my fellow panelist, Mr. Rowe, has noted on many occasions, IVHS requires unprecedented levels of coordination among public agencies as they seek to integrate their systems. These coordination issues are particularly acute when attempting to link agencies together in order to provide a truly multi-modal IVHS service. Additionally, IVHS places great emphasis on public-private partnerships, and in this regard, I look forward to hearing the comments from the Motorola and Delco representatives on the panel.

Much of our work at George Mason has focused on these institutional issues, and has addressed questions such as: Will metropolitan areas be able to achieve the coordination needed for integrated IVHS systems? Will there be sufficient market demand for IVHS products and services to engender sustained private sector interest in the program? How should standards be developed that will facilitate rather than inhibit market innovations? What are the uniquely public sector goals of the IVHS program? What lessons will the operational field tests provide in understanding the influence of institutions on IVHS performance?

Unfortunately, time constraints preclude me from providing you with a full briefing on our research results. The point I would like to make today is the importance of continuing congressional attention to these issues. Unlike some technical issues, they are very dynamic, and hence don't go away. And for this reason, the report to Congress should be viewed as a point of departure for integrating non-technical issues into the overall IVHS program. I would encourage the committee to take an active role in reviewing and acting upon the results raised in the non-technical report, including soliciting views from a wide range of parties, perhaps through a hearing such as you have arranged today.

Other Evaluation Opportunities

Finally, I should note that the evaluation areas I have mentioned this morning do not by any means exhaust the range of issues and methods that should be considered by the national program. For example, we have much to learn from the approaches that are being taken to evaluate IVHS in other parts of the world, such as in Europe and Asia.

Moreover, given the potential costs of IVHS, there is an increasing need to use--where possible--sophisticated models and simulations to obtain prospective data on possible IVHS effects. Nonetheless, these and other evaluation issues underscore the central point of my statement: the need to develop mechanisms for producing reliable and timely information on IVHS effects.

Conclusion

Let me close by saying that the IVHS program represents a bold and exciting initiative to bring the advances in communications and related technologies to the surface transportation system. Both the Congress and the Department of Transportation are to be commended for their leadership in both initiating the program and in undertaking such a broad range of activities within such a short time period. There is no doubt that the federal program has been a driving force in creating momentum for IVHS in the United States.

Ultimately, however, the program must stand the scrutiny of those who may not be enamored with either fancy technologies or strong federal programs. And the current six year authorization represents a crucial opportunity to develop a sound track record for the program. While Department of Transportation has initiated several activities that aim in this direction, I believe the program would continue to benefit from sustained congressional attention. The development of quality information on IVHS effects--both technical and non-technical--directly serves the interests of this committee as it seeks to assess its support of IVHS. It also serves the multitude of public and private sector decision-makers who will face IVHS-related investment decisions in a period of increasingly limited resources. And ultimately, it enhances the ability of the country to assess the public interest in IVHS.

At George Mason, we look forward to contributing our part to this goal. We have been grateful for the support the Committee has provided to our efforts in the past, and would be glad to assist the Committee in any element of this significant national undertaking.

References

IVHS America (1992), *Federal IVHS Program Recommendations*, Washington, D.C.: IVHS America.

IVHS America (1993), *Proceedings of a National Workshop on IVHS Benefits, Evaluations, and Costs,* Washington, D.C.: IVHS America, (forthcoming).

U.S. General Accounting Office (1991), *Smart Highways: An Assessment of Their Potential to Improve Travel*, GAO/PEMD-91-18 Washington, D.C..

ATTACHMENT 1
RECENT PAPERS BY GEORGE MASON UNIVERSITY ON INTELLIGENT-VEHICLE HIGHWAY SYSTEMS

"Cumulative Evaluations in Surface Transportation", Thomas Horan, *Evaluation Practice*, vol. 13, no. 2, 1992, p. 117-123.

"Determining Congestion and Air Quality Effects: The Need for Field and Forecast Data on IVHS Technologies", Thomas Horan and Jonathan Gifford, *Modeling and Simulation*. v. 23, p. 1319-1325.

"Evaluating Institutional Effectiveness: Development of Concepts and methods for Incorporation into IVHS Operational Tests", Jonathan Gifford, Thomas Horan, Roger Stough, and Brien Benson, presented at FHWA Workshop on Public and Private Sector Roles in IVHS Deployment, April 1992.

"Impact of Network Configuration on the Efficacy of IVHS", Terry Friesz, Roger Stough, Rajendra Kulkarni, and Saiid Ganjalizadeh, *Modeling and Simulation*, vol. 23, 1992, p. 1325-1332.

"IVHS/RTI Institutional and Environmental Issues: A Strategic Policy Research and Outreach Agenda for the United States", Jonathan Gifford, Thomas Horan, and Daniel Sperling, *Vehicle Navigation and Information Systems*, 1992.

"IVHS and Planning", Thomas Horan, *Transportation Planning*, vol. 11 (3), Fall 1992, p. 13-15.

"Markets for Advanced Traveler Information Systems", Brien Benson, *Modeling and Simulation*, 1992.

"New Dimensions in Infrastructure Evaluation: The Case of Non-Technical Issues in Intelligent Vehicle-Highway Systems", Thomas Horan and Jonathan Gifford, *Policy Studies Journal*, Spring 1993 (forthcoming).

"Policy Analysis and Uncertainty: Lessons from the IVHS Transportation Development Process", Kingsley Haynes and Li Quiangsheng, *Computing, Environment and Urban Systems*, Vol 17., 1993, p. 1-14.

"Standards for Intelligent Vehicle-Highway System Technologies", Jonathan Gifford, *Transportation Research Record*, no. 1358, 1992, p. 22-28.

"Toward Adaptive IVHS: The role of Impact Assessments in Guiding the Development of Advanced Transportation Technologies", Thomas Horan, *Proceedings of a National Workshop on IVHS Benefits, Evaluations, and Costs*, Washington, D.C. : IVHS America, Spring, 1993.

Transportation, Information Technology and Public Policy – Institutional and Environmental Issues in IVHS: Proceedings of a Workshop on Institutional and Environmental Issues, Asilomar Conference Center, Monterey, California, April 26-28, 1992, Jonathan L. Gifford, Thomas A. Horan, and Daniel Sperling (Eds.). Fairfax, VA: George Mason University (and University of California, Davis).

ATTACHMENT 2

TOWARD ADAPTIVE IVHS:
THE ROLE OF IMPACT ASSESSMENTS IN GUIDING THE DEVELOPMENT OF ADVANCED TRANSPORTATION TECHNOLOGIES[1]

Thomas A. Horan, Ph.D.
Institute of Public Policy
George Mason University

INTRODUCTION

With massive increases in federal support for IVHS, it has become imperative to demonstrate the effectiveness of IVHS as these programs unfold. While limited but positive empirical evidence might have been sufficient to initiate the program, the need for sound empirical data is now warranted. This paper is meant to stimulate thinking about how national impacts of IVHS should be assessed and the role of a national evaluation strategy in ensuring the development of needed impact data.

Orientation of Paper

Early activities in the estimation of IVHS benefits started with a definition of the technology (including ATMS, ATIS, AVCS, CVO, APTS) and then sought to derive the benefits that could accrue to the technology (Mobility 2000, 1990; IVHS America, 1992). This can be considered a "technology-nested" approach to analysis. The advantage to this approach is that it has aided in defining the nature and range of IVHS configurations. The downside to this approach is that it has treated benefits as a secondary matter, that is, something that flowed from the technology, but did not necessarily condition the choice of technology.

The approach of this paper is the converse: it begins with an overview of the transportation policy context and then considers the potential of IVHS to make improvements in needed areas. This could be considered a "benefit-nested" approach; that is, it considers IVHS technology not as a given, but rather as a range of approaches that can be drawn upon to achieve desired benefits in a variety of areas.

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[1] This paper was prepared for the National Workshop on IVHS Benefits, Evaluations, and Costs. The proceedings are being published by IVHS America and will be available in Spring, 1993.

ATTACHMENT 2

The Transportation Policy Context

Before one begins to consider the potential impact of IVHS on transportation systems, it is necessary to understand the current travelling and transportation policy issues which will affect these systems. With regard to the former, recent federal statistics provide insights into current travel conditions.

Current Transportation Patterns

The 1990 census provides the most recent update on travel patterns. Between 1980 and 1990, significant changes occurred in travel behavior. During this decade, while the population grew by slightly under 10% (to 248.7 million), the number of new workers grew by 19.1% (to 115 million) and vehicles by 17%. In spite of this large rise in workers and vehicles--and perhaps the greatest surprise of the survey--most alternative forms of commuting (e.g. carpooling, vanpooling) fell off precipitously, with carpooling decreasing by over 30% (to just over 13-percent). Interestingly, while telecommuting remains a rather small percentage (3-percent), it nonetheless represented the only--and in fact rather dramatic --growth (up 50-percent) of the alternative commute options. (FHWA, 1992a)

The reasons surrounding this paradoxical growth in both commuting and single auto use have been captured by both quantitative and qualitative accounts. According to the 1990 NTPS survey, over 75% of the population now live in urban areas, and more significantly, over 50% now commute from a suburban residence to a suburban office setting (DOT, 1991). On a more qualitative level, in his book *Edge Cities: Life on the New Frontier*, Joel Garreau chronicled how the American landscape has seen a steady rise in suburban existence, an existence which places a premium on automobile use both because of the low densities and because of the common occurrence of two income households.

Fueling this rise in edge cities was pronounced economic growth, particularly in the sun-belt regions of the United States. As mentioned, between 1980 and 1990 over 19 million new jobs were created and the economy grew (to 1988) at a 3-percent annual average (Statistical Abstract of the United States, 1991). By the mid 1980s areas such as the Silicon Valley in California or the Route 128 Corridor in Massachusetts were reaping the benefits of such economic growth, particularly as it related to the explosion in information technologies and the build up in defense technologies. (By the end of the 1980s, the bubble on this economic activity had burst, causing greater concern for economic policies that could guide a resurgence in the economy.)

Not all areas of the country benefitted equally from the 1980's boom, and in particular, both rural areas and inner cities continued to have significant unmet needs, including but not limited

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to transportation. Studies such as one by Mark Hughes (1992) have noted unmet mobility needs of inner city residents to get to the high(er) paying jobs located in the suburbs. And with general movement toward metropolitan areas, rural populations now contain a disproportionate share of elderly and poor populations, groups for which transportation is a central means of connecting with social and medical services (Braaten, 1992).

Current Transportation Problems

Several contemporary surface transportation problems flow rather directly from these population and travel trends. In metropolitan areas, congestion has continued to grow throughout the 1980's. As has been noted by the Department of Transportation, congestion growth was unabated during the 1980s; peak period freeway congestion reached 70% in 1989, up 41 percent from 1975 (DOT, 1991). During this time period, air quality problems grew to plague more than 100 metropolitan areas, with emissions from automobiles being a major contributing force (EPA, 1990)[2].

Transportation also continued to be a major consumer of energy, accounting for 27% of U.S. energy consumption and 63% of petroleum consumption in 1989. In the safety area, significant gains were made in the rate of fatalities, as during the decade of the 1980s fatalities per million declined from 3.3 to 2.16 fatalities per 100 million vehicle miles-of-travel (DOT, 1991). The highway fatalities in 1991 were 41,150, the lowest number of traffic deaths in 30 years (Parker, 1992): Nonetheless, automobile accidents still remained as the number one cause of death for young people (ages 5-32), and the overall economic loss due to crashes is estimated to exceed $100 billion annually (Parker, 1992; Waller, 1991).

Recent Federal Legislation

Against this backdrop, the 102nd Congress passed aggressive pieces of legislation aimed at turning the tide on the negative aspects of surface transportation. These include acts in the areas of clean air, transportation, energy, and disability.

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[2] Recent data does suggest that air quality has improved in several cities. A recent report by EPA noted that, while 86 million people still breath unhealthy air, cooler whether as well as technological improvement had contributed to improved conditions in 41 cities during the period 1989 to 1991. (New York Times, 1992)

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Clean Air

The Clean Air Act Amendments of 1990 set aggressive mandates for emission reduction. They also contained sweeping changes in the way transportation projects are considered in metropolitan areas. In particular, many metropolitan areas will have to show that proposed transportation programs are in "conformity" with air quality goals for the region. This requirement will place a considerable burden on regions to demonstrate--typically using transportation models--the possible impact of various transportation improvements, potentially including IVHS projects.

In addition to this conformity requirement, the act places increased emphasis on transportation management techniques, referred to in the act as "transportation control measures" (see also Epstein, 1992). Section 108 of the act specifies a variety of these activities that should be considered in the air quality plans of nonattainment areas. These and related sections have created strong regulatory pressures to develop transportation improvement programs that will support regional emission and related VMT (vehicle miles traveled) goals.

Transportation

The Intermodel Surface Transportation Efficiency Act (ISTEA) of 1991 continued this trend, while ostensibly committing $151 billion to the domestic economy. The act gave significant responsibility to metropolitan planning organizations in developing transportation programs for metropolitan areas. The act also reinforced the need for transportation programs to be in conformity with the Clean Air Act. For example, in nonattainment areas new capacity can only be constructed if it is contained in a congestion management system. Further, the act created a $6 billion congestion mitigation and air-quality program to financially support a broad array of low-cost transportation demand management strategies encouraged by both acts.

A separate theme of ISTEA was support for new technology, thus providing the substantial amount of funds currently available for IVHS. Title I of this legislation includes the Intelligent Vehicle-Highway Systems Act of 1991, which authorizes $660 million for IVHS research and testing, approximately $500 million of which is for testing IVHS technologies on "IVHS Corridors" and approximately $160 million for other IVHS research activities (FHWA, 1992b).

Included in this authorizing legislation are several provisions that give direction for setting research, testing, and evaluation priorities in the federal IVHS program. Specifically, the act calls for both a strategic plan that will serve as a blueprint for determining research and testing priorities and an analysis of "nontechnical constraints and barriers," including institutional and legal challenges to an effective IVHS program. In addition (and as discussed in greater detail below), the legislation requires the development of evaluation guidelines for IVHS testing and written evaluations for federally sponsored IVHS field tests.

Energy

One of the final pieces of legislation passed by the 102nd Congress was the Energy Policy Act of 1992, a bill which enacts the most sweeping changes in the nation's energy laws since 1978 (Hausker, 1992). While most of the bill focuses on energy production and efficiency issues, it does contain authorizations for developing advanced transportation technologies. Specifically, the act contains several provisions supporting electric vehicle research and development. One section authorizes up to $50 million to support national demonstrations of electric vehicles. A second section authorizes the creation of a electric vehicle infrastructure development program to support of electric vehicles. A third section of the bill authorizes the creation of a state and local incentives program to encourage local testing and deployment of electric vehicles.

In addition to these technology efforts, the energy bill also further encourages the use of market-based transportation mechanisms. Specifically the bill allows employers to provide a benefit of $60 a month per employee tax free for ridesharing and transit passes. And the bill also caps the amount of free parking supplied by the employer to $145 per month per employee. Amounts over the $145 would be taxable as in-kind income.

Disabilities

Finally, with regard to the social impacts of transportation, the Americans with Disabilities Act of 1990 requires that public transportation facilities be equally accessible to all Americans. This will place tremendous pressure on transportation facilities that can assist in these mobility needs. In particular, transit agencies are being forced to consider cost-effective mechanisms for implementing ADA requirements in metropolitan areas.

REVIEW OF EXPECTED IVHS IMPACTS

This (albeit brief) review of current transportation patterns, problems, and attendant federal legislation highlights the context in which IVHS must operate. Clearly, there remain significant problems to address in the areas of congestion, safety, environment, energy, mobility, and productivity, and IVHS must operate within this multi-policy framework. Consequently, there is a premium on understanding the value-added by IVHS in achieving these goals in a manner that complements--not contradicts--other related strategies. This section reviews major impact areas, and in doing so, takes a first step toward highlighting potential focal areas.

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Several early activities were conducted to better understand the potential impact that IVHS could have on a variety of transportation areas. Mobility 2000 (1990) conducted a range of analyses that helped form the basis for the objectives later contained in IVHS America's Strategic Plan (IVHS America, 1992). The Strategic Plan, completed in May, 1992, provides the overarching framework for considering the benefits that could accrue to IVHS, as expected by the IVHS community. It therefore serves as a useful point of departure for highlighting potential gains, known uncertainties, and possible focal areas. Major impact areas include the following.

Congestion Reduction

Congestion is widely viewed as a major area where IVHS could have positive impacts. The Strategic Plan notes the costs of congestion on the domestic economy, considered to be in excess of $100 billion annually. According to the Strategic Plan, IVHS is expected to reduce these congestion costs by 10% in a significant number of metropolitan areas by 2001 and up to 20% by 2011.

The backbone of near-term IVHS deployment are traffic management centers conducting ATMS activities. These centers are being considered or developed in several areas around the country, and could provide the earliest demonstrable benefits from IVHS. Initial experiences, such as with the ATSAC system in Los Angeles, suggest that significant--though moderate--corridor level effects can be expected from these systems (for example, as has been widely reported, the ATSAC evaluation demonstrated a 13.2-percent reduction in travel time on the corridor, with a similar level of effectiveness expected for the larger Smart Corridor) (see Jacobson, 1992).

While these experiences provide some confidence that near-term IVHS can affect travel flows along congested corridors, the ability to demonstrate regional improvements is more problematic. Recent modelling exercises--particularly in the air quality area--have highlighted the difficulty in assessing overall regional gains, and consequently, suggests that estimations of near-term IVHS objectives should be viewed with substantial caution. In particular, a recent lawsuit in the San Francisco area provides an important example on the difficulty in estimating regional traffic effects. In this case, environmental groups sued the State of California, claiming that certain infrastructure improvements would worsen emissions. In the resulting legal transactions, MTC was asked to model the potential results of implementing (versus not implementing) their entire regional TIP for the San Francisco area. This multi-billion dollar TIP contained only a 2% increase in lane miles, and a 40% increase in HOV as well as significant increases in transit.

Yet using among the sophisticated modelling procedures available, it showed barely a 1% improvement in emissions. (Harvey and Deakin, 1991).[3]

Given such caution, what congestion benefits could serve as a useful indicator for IVHS congestion-impact in the near (and medium) term? One possibility is the reduction of non-recurring congestion. The Strategic Plan notes how over half (56%) of congestion is due to non-recurrent factors, and how ATMS and ATIS could be effective in detecting these accidents/ incidents. This high percentage of congestion due to accidents suggests the freeway system suffers from inefficiencies that could be demonstrably ameliorated through near-term attention.

Consequently, a more specific objective should be developed for measuring the effectiveness of the program in reducing congestion. With regional effects rather difficult to ascertain (particularly in the near-term), more focused effects--such as reduction in non-recurring congestion--could be more realizable and trackable. Incident-based delay savings were, for example, the key delay impact calculated in the evaluation of the INFORM project in New York (Smith, 1992) and is the focus of related activities in Northern Virginia (Hobeika, 1992).

In addition to the non-recurring focal impact, selected examples of success could include the impacts of AVI on toll way congestion (a particularly salient impact on the East Coast), and the impact of APTS multimodal information on employer-level mode-split (a particularly salient impact for non-attainment areas, such as on the West Coast). Also, the recent census data on telecommuting suggests that there is a growing market for at home informational technologies.

Safety Enhancement

Safety is also viewed as a major area for IVHS impact. Based on data from NHTSA, the U.S. suffered from 41,000 deaths and 5,000,000 injuries on the nation's highways in 1991. The Strategic Plan estimates that IVHS could reduce the number of fatalities and the number of annual injuries by 8% by 2011. Mobility 2000 had estimated 18.9%; but the figure was reduced by 60% due to revised low expected penetration. Indeed, the lead time needed to deploy advanced safety systems is a major factor affected the expected contribution of these technologies.

In the original Mobility 2000 calculation, various warning systems (warning to apply brakes, driver impairment warning) accounting for about 75% of safety gains (Mobility 2000, 1990). More recent research sponsored by NHTSA has confirmed the potential value of headway detection in avoiding incidents: modelling of a hypothetical 300 foot headway detection system found that up to 92 percent of a sample of rear-end collisions were theoretically avoidable (Knipling, et al, 1992). The authors hastened to note, however, that the actual figure would probably be much lower, and that more research would be needed to understand the factors affecting eventual success. Moreover, while the data suggest that collision-avoidance systems could make important gains in safety, their deployment is subject to private sector decisions, raising additional uncertainty about near-term deployment.

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[3] **One of the major reasons given for such a result is that for major metropolitan areas such as San Francisco, much of the infrastructure already in place and consequently, even ambitious plans are hard to detect at the regional level. (see FHWA, 1992c)**

In lieu of the demonstrating such impacts, it becomes increasingly important to demonstrate targeted impacts, especially across a range of potential users. For this reason, activities focusing on safety of particular groups should be accelerated. For example, greater efforts could be made to test and introduce IVHS-related safety technologies to both law enforcement and health profession groups. A recent use of heads-up displays in police cars is an example of the former (see Business Wire, 1992). While no major tests are underway focusing on ambulances, several safety experts have noted the potential importance of using these technologies to assist in getting automobile accident victims to the hospital within the "golden hour" (Finklestein, 1992). Related suggestions have been made for targeting IVHS to improve the safety of specific groups such as the elderly drivers and female commercial drivers (Waller, 1992)

Environmental and Energy Effects

The Strategic Plan notes the need to reduce harmful emissions. Emissions from the transportation sector account for 43% of total emissions of nitrogen oxides, 31% of hydrocarbons, and 66% of carbon dioxides. While the Strategic Plan does not contain any empirical estimations about the potential impact of IVHS on these areas, the plan notes that reduced emissions and fuel usage would occur through reductions in delay. Early estimates had expected up to 6.5 billion gallons of fuel saved by 2010 (Mobility 2000, 1990); these have been revised downward due to less optimistic penetrations (Cheslow, 1992).

Indeed, while the Strategic Plan and related analysis suggests positive benefits in these areas, this should not be viewed as suggesting there is a consensus on the direction and magnitude of such benefits. While some believe that IVHS will positively affect near-term emissions through smoother traffic flows (and related demand management applications), others contend that induced demand from IVHS could result in negative benefits (see Shladover [1991] and Gordon [1992] for two contrasting perspectives). The aforementioned clean-air legislation regarding the need for transportation projects to be in "conformity" with air quality goals raises the need to attend to these uncertainties.

A recent conference on IVHS and the environment addressed several issues relating to the IVHS/environment interface (Gifford, Horan, and Sperling, 1992). A theme that ran through many of the papers was that--while near-term ATMS systems could provide moderate air-quality benefits through smoother traffic flows--more dramatic gains (including avoiding emission setbacks) would require the marrying of IVHS technologies which other policies and technologies. Three mentioned were congestion-pricing, super-emitter detection, and electric vehicles (Hempel, 1992; Horan, 1992).

In his paper for the conference, Hempel noted that these three strategies could enhance the effectiveness of IVHS in the air-quality and energy areas. Regarding congestion pricing, recent estimates have found it to be among the most effective transportation demand management strategies (e.g. Cameron, 1991) and its implementation is clearly dependent on AVI technology. As for gross polluters, a recent report by the National Research Council reports that close to 60% of emissions can be traced to 10% of vehicles (National Research Council, 1991) and recent developments in remote sensing technologies provide a potential technological link to identifying these vehicles (Hempel, 1992). Finally, the aforementioned energy bill authorizations for electric vehicles and other clean-fuels provide a strong policy thrust to deploy these clean technologies. While not explicitly dependent on IVHS technologies, cooperative possibilities exist with regard to providing or locating electric charging sources.

Economic Productivity

The economic gains from IVHS are considered vital to its overall success. As has been widely reported, the Strategic Plan estimates that up to 80% of the overall costs of IVHS will come from private sector and consumer decisions. To the extent that this estimate is realized, IVHS could indeed represent a significant domestic economic activity. While the Strategic Plan does not contain any quantitative objectives in this area, it does note the expectation that IVHS will lead to productivity growth through reduced costs and improved efficiencies of the transportation sector.

Given the recent decline in domestic economic productivity, there has been heightened interest (as well as skepticism) in the capability of infrastructure investment to enhance economic performance (see FHWA, 1992d). While several studies have noted that infrastructure investment in IVHS can be viewed as having systemwide effects on the economy, estimating the nature and magnitude of these effects is fraught with methodological complications (Mudge and Griffin, 1992).

Consequently, while IVHS has the potential to contribute to the overall economic performance of the infrastructure, more local and specified demonstration is warranted. Moreover, within the near-term the federal government has been tasked with providing substantial funds for IVHS and this engenders its own form of cost benefit analyses, given that public funds to IVHS could cross the $1 billion mark by the end of the century. This suggests the need to assess the costs and benefits of IVHS from a variety of perspectives.

At the user level, the key issue appears to be "willingness to pay" among consumers. And a variety of indicators will need to be developed on the value of invehicle information to the consumer (Benson, 1991). A more complicated question that should be posed is how these private benefits relate to public benefits, especially with regard to the use of government subsidies. As public sector ATIS infrastructure could act as an indirect subsidy for the user, the opportunity costs of such a subsidy compared to other subsidies (or no subsidies) needs to be assessed. For example, what would serve the public interest more: a indirect subsidy of $300 per vehicle to promote invehicle ADIS usage or a similar subsidy to promote a prestart catalytic warmer which could eliminate pollution from cold starts?

In addition to the cost-benefit evaluation of public sector funding, the market itself is moving ahead in a number of areas, and this provides an important indication of where there is a natural market interest in IVHS related projects. For example, the use of AVL equipment by the trucking industry, and safety related AVSC equipment by the commercial transportation industry (e.g. Greyhound Bus) represents perhaps the most hard-nosed types of assessments that are being done in the area. For this reason, they represent an important form of information that could be useful in ascertaining the types of benefits across the country.

On a more macro-level, analysis needs to be done comparing alternative investments in IVHS versus other technological programs (e.g. Maglev). An initial comparative analysis has been conducted by Boghani (1992) and it reflects favorably on IVHS. This study found that IVHS could return substantial benefits at relatively modest costs, as compared to telecommunications (substitution), Maglev, and alternative fuels. While the Boghani estimate was conducted at the national level, a strong argument could be made for focusing a comparative analysis on the regional level. Such a focus would be more sensitive to regional economic differences and would also be consistent with the regional orientation of ISTEA policies (see below).

Social Impacts

The implications of IVHS on various social groups is emerging as an area warranting further inquiry. The Strategic Plan does not have explicit objectives regarding social impacts, but, as the following quote demonstrates, the plan does recognize the role of IVHS in this area:

> "Over the next 20 years, a national IVHS program could have a greater societal impact than even the Interstate Highway System...there are benefits, for instance to rural drivers as well as those in congested metropolitan areas; for older as well as younger drivers, and for the current riders of public transportation systems as well as those who will be attracted to public transportation by the enhancements that IVHS helps to make possible..." (p. I-4).

While this quotation notes the wide array of impacts potentially available from IVHS, some have called for a more focused inquiry into how IVHS could aid in addressing specific social conditions. In particular, Waller (1992) has noted how IVHS could be developed to assist a variety of groups, including elderly drivers and women travellers. Inherent in her analysis is the need to focus on the social and demographic trends in the country and then develop technologies suited for improving upon these situations.

With regard to current legislative mandates, the most apparent group to be affected are the disabled. The aforementioned ADA legislation has reinforced the need for the transportation industry to provide comparable service for the some eight million persons who are mobility impaired. IVHS can serve a very useful function in aiding transit agencies in their development of reliable, cost-effective services that meet the requirements of ADA.

Institutional Impacts

IVHS will both depend upon as well as impact the various transportation and related public agencies charged with carrying out the program. The transportation industry has traditionally focused on designing, constructing and maintaining highway and transit facilities. Consequently, IVHS presents a host of new issues for the industry. The Strategic Plan notes the institutional as well as legal challenges that will confront highway (and transit) agencies as they seek to incorporate this information infrastructure into their processes and systems.

Within the general gamut of institutional challenges, public/private cooperation is receiving an increasing amount of attention. At a recent conference held by FHWA on the subject, the importance of fostering private sector involvement in IVHS testing was highlighted (FHWA, 1992e). And, as a result, a range of research activities are underway to understand possible models for drawing upon private sector capital and capabilities in designing and developing IVHS systems .

A second focal area which deserves attention is understanding the role of IVHS within the context of regional governance. One of the key aspects of the ISTEA legislation was its recognition and reinforcement of regional planning and programming decisions. The newly created Surface Transportation Program, as well as the accompanying metropolitan planning requirements, stress the need to provide flexibility at the federal level so that regions can make investment decisions geared to their needs. Analysis and program changes are required to understand how IVHS could fit within this policy framework, as the current wave of operational tests and related demonstration projects have largely fallen outside of metropolitan planning efforts.

Other Benefits

IVHS has often been compared to the interstate system, including the extent to which the benefits of such major systems can not always be anticipated (Mobility 2000, 1990). And for IVHS, there are undoubtedly many potential outcomes--both positive and negative--that cannot be fully captured in any ex ante analysis. However, it is worth noting that underlying IVHS--

and indeed tensions surrounding it--is the potential influence of the technology on urban form and, more generally, the quality of life.

The Strategic Plan noted, in its vision statement, that IVHS "is in fact, a paradigm shift, .. a new way of looking at, thinking about, and improving mobility--a sociological as well as a technological revolution" (p.II-4). Whether such will be the case remains to be seen, but what can be affirmed at this point (and will be discussed in greater detail below) is that our democratic system requires soliciting a wide spectrum of input on the desirability of such a change, and analyzing what the system implies for future urban form and traveler behavior.

Benefits Summary

This review of potential benefits is meant to highlight areas where IVHS could show demonstrable impact over the next several years. These areas of summarized in Table 1. The general theme of this review is that consideration needs to be given to targeting areas for demonstrable impact. In doing so, this is not to suggest that each benefit should be treated separately, for the cumulative and/or offsetting aspects to IVHS need to be understood and factored into the program. Rather, what the review does suggest is that it is not inherently sufficient to focus on ATMS/ATIS produced smoother traffic flows, and then suggest that the secondary impacts (on safety, emissions, etc) are adequate. Instead, by treating these secondary effects as in fact primary, there emerges a different context for considering strategic testing and partnership opportunities. Issues such as these raise the question of the overall national evaluation program and the priorities of the federal effort. It is this topic to which we now turn.

Table 1 : Summary of IVHS Benefit Issues

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Table 1 : Summary of IVHS Benefit Issues

BENEFIT AREA	SOURCES OF BENEFIT CALCULATIONS			
	MOBILITY 2000 (1990)	STRATEGIC PLAN	OTHER DATA	FOCAL AREAS
Congestion	25-40% reduction in congestion costs by 2010.	15-20% reduce in congestion costs in selected metropolitan areas by 2011.	Smart Corridor; Inform; Bay Area.	traffic management centers; reduction in non-recurring congestion; mode-change; toll reduction.
Safety	reduce annual fatalities by 18.9% by 2011.	reduce annual fatalities by 8% by 2011.	exposure rates; modelling of accident prevention.	special populations; health care transportation.
Energy and Environment	6.5 billion gallons of fuel saved by 2010.	general objective to reduce harmful emissions and fuel wasted.	Mitre: 3.8 billion gallons of fuel saved by 2010.	smoother traffic flows also: super emitters, electric vehicles, etc.
Economic Productivity	not an explicit operational benefit.	general objectives to establish U.S. based industry; estimation that 80% of IVHS cost to be in private sector.	several conflicting studies on relationship between infrastructure spending and productivity.	regional impacts of IVHS investment vis-a-vis other infrastructure investments. commercial applications and analyses.
Social Impacts	notes role of IVHS for older driver, impaired traveler, rural residents, etc.	no explicit objectives on social impacts; general statements on range of IVHS effects.	number of people over 75 expected to double by 2000 (to 65 million). 8 million mobility impaired.	special population assessment; broad social impact assessment.
Institutional Impacts	not an explicit operational benefit.	general objectives to develop new modes of operation among public and private organizations.	recent research and conference activities highlighting alternative public versus private sector roles.	public vs private sector roles; regional technology governance.

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THE EVALUATION MANDATE

Initiation of Evaluation Guidance

The need for developing sound evaluation information on achieving IVHS benefits is a core consideration of the federal IVHS program. Prior to the passage of ISTEA, GAO conducted a review of IVHS to ascertain both the nature of the empirical information on IVHS and the role that evaluation was playing in producing needed information on IVHS effectiveness (GAO, 1991). As part of that review, we specifically examined the extent to which empirical data existed on IVHS.

While there was a consensus among the 38 reports we reviewed that IVHS would have a positive effect on the surface transportation system, we found that for the most part these conclusions were not based on empirical field data. Rather, they were based on model simulations, more basic estimations, and even pure speculation. Consequently, GAO recommended that the Congress include specific evaluation requirements in the surface transportation legislation to ensure the development of IVHS performance data.

The evaluation recommendations from the IVHS report were subsequently incorporated into the IVHS portion of ISTEA, the result being a legislative requirement that evaluation protocols be developed for IVHS and that federally funded operational tests be required to submit evaluation reports (Horan, 1992). This means that a very clear mandate exists for DOT to take a leadership role in developing a national evaluation strategy to guide IVHS testing.

Recent Federal Activities

Subsequent to the passage of ISTEA, the Department of Transportation has initiated several activities to develop evaluation standards, models and protocols.

One federal research area involves designing an overall conceptual framework to guide development of IVHS evaluations. The thrust of this work has been to develop a standardized approach that could be used by the various operational tests to ensure consistently across tests in how the evaluations are structured or reported (Mitre, 1991). It is worth noting that while this effort is justifiably aimed at ensuring standardization across the various field operational tests, it does not address the merits of the various tests and how they could be constructed to produce cumulative or complementary information.

A second related activity is participation in and support of various field test evaluations (Stephens, 1992). Operational field tests represent a major component of the federal IVHS program and, accordingly, the Department of Transportation is taking steps to ensure that useful data are developed. The most elaborate to date is the TravTek evaluation in Orlando, FL. The evaluation of this project is quite extensive, consisting of 11 separate yet integrated studies ranging from yoked driver studies to overall macro-analysis of the project's impact. A second major demonstration being developed is for the Advance project in Chicago, IL. A key element of the Advance project is its testing of 5,000 vehicles as probes for monitoring traffic flow. Consequently, a major element of the evaluation will be extent to which the probes can accurately convey trip information. Other evaluation questions will be asked which are similar in nature to the TravTek study, though there is no cross-test analysis to be conducted. (A more complete review of operational tests can be found in the companion paper by Humphrey).

FHWA is also sponsoring work by the Volpe National Transportation Systems Center (VNTSC) to develop a series of models to look at the corridor and regional impacts of IVHS technologies. This analysis includes not only short-term effects on corridor locations, but long-term effects as well. The indices being considered are congestion, fuel usage, air quality, and safety. The models will also attempt to incorporate some sensitivity analysis about the relative effects of IVHS, given alternative levels of market penetration. The modelling will include some safety components, though according to the analysts involved, the types of data that the models are relying on are rather rudimentary.

FTA is also sponsoring evaluation work through VNTSC. One project involves conducting case studies on evaluation issues. A second study involves developing an evaluation methodology for AVL case studies. A third study is developing several scenarios for APTS development and evaluation. (A more complete review of the methodologies being investigated can be found in the companion paper by Underwood).

While these activities will accelerate evaluation concepts and approaches, events seem to be overtaking this work. In a letter to the IVHS America Coordinating Council, the Chairman of the Benefits, Evaluation and Costs Committee noted:

> "Reviews conducted by the Benefits, Evaluation and Cost Committee indicate that (1) present plans for National Operational Tests are non-uniform in their general procedures for conducting evaluations, and (2) such plans are idiosyncratic in their translations of general goals to specific measurable objectives. The Committee judges this situation to be the result of a strong emphasis on putting IVHS technologies in place quickly, without comparable emphasis on system performance criteria, benchmarks, testing methods, and overall evaluation planning." (BEC Committee, May 4, 1992)

Stated differently, the operational tests are getting ahead of the ability of the national program to provide guidance on what how a particular test should fit overall national evaluation needs. The designs and technological specifications appear to be occurring first and then the evaluation designs are being retrofitted within the context of the test. One possible result of this approach is that certain IVHS applications--for example, invehicle information--could be subject to an unnecessary concentration of research relative to the broad information requirements needed over the next several years. And conversely, several of the types of research areas addressed above will not receive adequate attention (for example, a field test focusing on environmental features has yet to be conducted). In order to ensure that such a mismatch is minimized in future years, a national evaluation strategy needs to be developed (Tornatsky, 1992).

What is a national evaluation strategy? Essentially it is a set of policy and programmatic actions to ensure that reliable and valid data are being developed on IVHS in a manner which will maximize achievement of transportation benefits while minimizing the public costs for achieving those benefits. In many ways the operational test program, related federal research, and upcoming systems architecture activities all share this related goal; the purpose of national evaluation strategy is to provide a cross-cutting device for ensuring that such information is developed.

Based on the review conducted in this paper, four elements seem particularly inherent to an overall evaluation strategy: conducting targeted national inquires, having a diversified research portfolio, performing regional impact analyses, and encouraging social impact assessments. These elements--each of these will be addressed in turn-- are not meant to convey the full features of a national evaluation strategy, but rather to convey important features which derive from a "benefit-nested" approach to IVHS.

National Impact Assessments

There is an immediate need to develop and conduct targeted national inquires. Currently, each operational field test appears to be its own island of inquiry that is not linked in any strategic manner to produce cumulative knowledge on IVHS (see Brand, 1992). For example, there has been minimal effort to systematically link results from operation field tests (a situation exemplified above in the separate consideration of the ADVANCE and TravTek projects).

In contrast to this approach, the field of program evaluation is replete with national programs that undertook systematic testing around the country (see Berk, 1985). For example, the Rockefeller Foundation is currently sponsoring randomized field experiments on welfare reform comparing performance of four urban areas. Even in the area of transportation, ISTEA calls for a national demonstration of up to six congestion pricing pilot programs representing a range of configurations and applications. Such a national evaluation approach needs to be part of the IVHS program. The national IVHS program has to take a more directive approach in ensuring that the range of tests have cumulative (rather than duplicative value) in demonstrating near term possibilities of IVHS. The recent activities toward designing an evaluation for AVL is a noteworthy step in this direction (see Casey and Labell, 1992).

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As a further example of what could be conducted under such an approach, consider a national impact evaluation on reducing nonrecurring congestion. Taking nonrecurring congestion as a focal impact area would be easily justified because (as noted earlier) it is a major form of congestion, can be quantified, and has causal factors that are more easily addressed (accidents are the major form of nonrecurring congestion, while recurring congestion is a function of a host of demand, link capacity, demographic, economic and social forces). Also, reducing nonrecurring congestion is one of the early impact areas expected from near-term ATMS/ATIS systems. Thus, assessing the impact of IVHS on nonrecurring congestion would provide a demonstrable focus area for the general objective of congestion reduction.

The structure of such an inquiry would involve obtaining baseline measures of non-recurring congestion on corridors to be IVHS-equipped and then comparing the reduction of non-recurring congestion along those corridors with similar corridors which were not equipped with IVHS. Ideally, these corridors would be located in different regions of the country, and could test different features of IVHS. In keeping with the near-term objective of IVHS, one could conduct ex ante analysis to ascertain the level of IVHS implementation needed to achieve a desired effect (e.g. 20-percent reduction), and then introduce the system best designed to achieve this effect. The results of this national impact assessment would ideally be available for policy-makers for use in considering IVHS reauthorization.

Diversified Research Portfolio

Other targeted evaluations should be undertaken, even if national level analyses are not possible. As exemplified by the above benefits review, IVHS could has potential for a wide range of applications. Indeed, one could argue that the ultimate success of IVHS is in large measure dependent on its ability to fuse with a constellation of possible settings and policies. For this reason, it is incumbent on the IVHS research program to develop a diversified research portfolio and to develop feedback and tracking mechanisms which will facilitate further inquiry into promising areas and minimize the use of public funds in less promising areas.

Politics--not unlike nature--abhors a vacuum, and to some extent the high concentration of IVHS funds devoted to selected corridors (via earmarking, etc.) is in part facilitated by lack of a diversified testing program focused on developing a range of evaluative information. An immediate need exists for the IVHS benefits community to clearly specify what the "testing portfolio" should contain and to recommend mechanisms to ensure that these considerations be implemented. Such an activity would be in keeping with the intent of some of the ISTEA language that IVHS operational tests (and the evaluation thereof) contribute the priorities established in the IVHS Strategic Plan. This priority listing could reflect and expand upon the recently submitted *Federal IVHS Program Recommendations* which notes that developing a national evaluation framework is considered to be the seventh highest priority out of 152 project ideas (IVHS America, 1992b).

Inherent in the need to develop a diversified research portfolio is the need to develop strategic partnerships to maximize the potential contribution of IVHS. Chen (1992) has suggested conducting targeted field evaluations in a range of areas, including congestion pricing, multimodal design, and environmental compliance. The above benefits review also suggests possibilities with regard to emissions caused by gross emitters and reducing delay time of ambulances in reaching traffic accidents. While IVHS America has rightly reinforced the need to work with the private sector to leverage their commitment to IVHS, similar attempts are needed with planning, air-quality, health care, economic development, and other groups to find the best context for IVHS.

Regional Impacts

While national and targeted evaluations are needed to develop data on the effectiveness of IVHS approaches, the appropriate implementation of these approaches must be seen and assessed within a regional context. As mentioned at the outset, recent transportation legislation (e.g. ISTEA) has strengthened the concept that regional areas should take a strong role in determining their surface transportation priorities.

IVHS has yet to fully address the extent to which the benefits might be region-specific. For example, it is plausible that certain metropolitan regions might have the necessary absorptive capacity to facilitate diversion strategies, while others are constrained by geographical boundaries from having such capabilities. Not withstanding the difficulties in measuring regional impacts, there is a need to develop an understanding of "interregional variability" in IVHS applicability so that there will not be an over-prescription of IVHS systems design. Understanding how regions vary in their composition--and how it effects diversion, mode split, and other travel behaviors-- could be key to designing effective IVHS systems. The recently devised Advanced Rural Transportation Systems (ARTS) can be viewed as a recognition of the need to consider regional aspects of IVHS in rural areas. A similar concept for urban areas is proposed by Larry Dahms, as he suggests the need to consider IVHS within the context of metropolitan transportation systems (see his comments elsewhere in the proceedings) .

A related concern pertains to the macro-economic effects of IVHS and related technological systems. The recent presidential election has given rise to the prospects of accelerated infrastructure investments in order to improve economic performance. Research in the regional science field has found that there can be significant regional differences in the extent to which infrastructure investments affect economic performance (Vickerman, 1992).

While much of this infrastructure analysis has focused on traditional capital investments, there is a need to better understand the comparative advantages of these types of investments vis a vis IVHS infrastructure investments. Consequently, a key area for analytical work to gain a better understanding of regional economic systems, including the extent to which the current infrastructure impedes economic productivity, and the extent to which traditional versus high-tech (e.g. IVHS) improvements would enhance economic performance.

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Social Impact Assessment

While IVHS should certainly be assessed for its contributions to the transportation and economic system, there is no doubt that IVHS could have profound qualitative effects. While modelling studies provide analysts with useful empirically-based scenarios, these should not be construed as substitutes for community input into preferred futures. Stated differently, social impacts are difficult to ascertain and, consequently, analysts need to be cautious about the extent to which they presume desired social effects in their forecasting and modelling efforts.

While the area of social impacts might be new to the IVHS community, other infrastructure programs have contended with this area for some time. In particular, the Army Corps of Engineers has had a long and instructive experience with introducing major change to communities. Consequently, their history provides lessons for the IVHS community.

During the 1960s, the Corps of Engineers incurred the wrath of environmentalists for a series of projects which understated (by the Corps) environmental effects (see Mazmanian and Nienaber, 1979). However, in response to the NEPA, the Corps developed Principals and Standards containing four "accounts": national economic development, environmental quality, regional economic development and social well being. As documented by Mazmanian and Nienaber (1979), the Corps then underwent a turbulent period of confrontation and change, but as a result have developed a range of social process activities that seek inclusion into project planning.

Known as "fishbowl planning", a central element to the Corps approach is to solicit widespread involvement from the earliest stages of the project. And due to these changes, the Corps is now generally regarded as attempting to be responsive the environmental and social concerns surrounding their projects (though the record still remains far from perfect).

The Corps seems particularly shy about presuming beneficial long term effects (or acceptance). Part of this hesitancy is a result of the requirement that the Corps conduct "cumulative evaluation" which is defined as "the probable impact of each proposal in relation to the cumulative effect created by other existing and anticipated structures or work in the general area." As one of their analysts notes:

> "Since we don't possess a crystal ball, the demand that the Corps assess cumulative impacts is really a requirement that we assess the potential impact of the project against the images members of the public have of what the future could or should be. This places the Corps right back in the public involvement game. To assess cumulative impacts, it is necessary to understand what the public's images of the future are, and how they see this proposed action interacting with those images." (Creighton, 1983, p. 471).

The Corps views conducting alternative future workshops as a key element to cumulative evaluations. While they admit such actions do not produce hard data on estimated effects, it more directly addresses the core concern behind the cumulative impact regulation: that mechanisms for incorporating the long range interests of the community be incorporated into the early planning of infrastructure projects.

The need for alternative future considerations was evident at the Asilomar Conference on IVHS. As we noted in our conference summary, there were basic concerns about whether the vision expressed in the Strategic Plan was the best vision for the future of transportation (Gifford, Horan, and Sperling, 1992). While it may in fact be a reasonable vision, based on the Corp's experience, this should not be considered as adequate. Evaluative research needs to be supported by soliciting views from diverse parties on alternative transportation futures.

CONCLUSION

The boldness of the IVHS America's Strategic Plan is commendable for focusing attention and resources on the role of technology in improving the surface transportation system. However, in the near term--which is the general focus of this paper--IVHS cannot *transform* transportation system effectiveness--for that effectiveness is due to a variety of circumstances beyond the elaborate control of IVHS. Rather IVHS can *enhance* transportation system effectiveness. While this dash of humility runs somewhat counter to the aggressive focus of the program, given the mandates of ISTEA for integrated regional approaches to transportation, it is incumbent on IVHS to fit within this broader domain.

In his article on "the psychology of small wins" Karl Weick (1984) discusses the problematic nature of change. In the article, he notes that no policy effort--no matter how well conceived--can fully attend to the variety of ailments to which it is aimed. And setting such as objectives (rather than goals) almost invariably leads to evaluations suggesting failure. For this reason, Weick suggests the importance of small wins, which when added together over time, lead to a cumulative justification for such a program.

The "small wins" strategy--a strategy to which this paper ascribes-- does not discount the potential long-term effects of IVHS, nor does it imply that advanced research should be reduced. Rather, it suggests an adaptive strategy which will allow IVHS to embody the best of technological developments (occurring as a result of aggressive advanced research) as they unfold over time. One need only to read of the recent advances in personal communication services (PCS) devices to grasp the extent to which developments can overtake expectations (see New York Times, 1992). IVHS deserves to be the robust transportation research program that can seize those developments offering the greatest impacts; a targeted, adaptive evaluation program can aid in this mission.

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BIOGRAPHICAL SKETCH
Thomas A. Horan, Ph.D.

Dr. Horan holds an appointment as Senior Fellow for Transportation and Evaluation Policy at George Mason University's Institute of Public Policy. In this position, he is responsible for developing and executing research on surface transportation policies. His recent activities have focused on the institutional, economic, and multi-modal assessment of intelligent vehicle-highway systems. In addition, he is responsible for teaching several graduate public policy courses.

Prior to joining the faculty at George Mason University, Dr. Horan served as a Senior Analyst with the U.S. General Accounting Office (GAO) in Washington, D.C., where he conducted a series of studies in preparation for the Intermodal Surface Transportation Efficiency Act of 1991. One of these studies assessed IVHS, and its findings and conclusions were drawn upon in the drafting of IVHS authorizing legislation.

Dr. Horan has also worked at the local level. From 1983-1987, he served as Supervisor for Research and Development at the Orange County Transit District in California.

He holds both an M.A. and Ph.D. from the Claremont Graduate School.

INTRODUCTION

Mr. CARR. Those words of advice are most helpful.

I might note before going to our next witness that I have been joined by two of our Committee members, a good friend from North Carolina, David Price, and another good friend of mine, Tom DeLay from the State of Texas.

I might point out to all of you that when we planned this hearing we thought that Congress would be in session this week. And when the Leadership of Congress decided to extend the recess one more week, I was immediately fearful that we would not have good attendance by the Members of the Committee at this hearing, but as you can see, it is an issue that people care about, want to learn about, and I think it is a great credit to you that so many have decided to show.

STATEMENT OF EDWIN ROWE

Mr. CARR. Our next witness is Mr. Rowe. Would you like to start?

Mr. ROWE. Chairman Carr, Members of the Committee, I want to thank you for this opportunity to be here this morning and present my views on the IVHS program. I have submitted a written statement for the record. And my focus this morning is going to be on the involvement of local agencies in the IVHS program.

Basically, these agencies will initially become most involved in a very important element of IVHS which has been named advanced traffic management systems or ATMS for short. These ATMS systems constitute a basic building block of the IVHS program with very important links to the other building blocks which will come somewhat later such as the advanced traffic traveler information systems.

The ATMS systems provide some very basic functions such as monitoring the condition of traffic flow on our highways and freeways in the Nation. This information is communicated to control centers which will be provided with the necessary tools to respond to ever changing traffic conditions.

The ATMS systems that the local agencies will be involved in can be considered as an early public infrastructure effort which will provide, in effect, the smart highways component of IVHS to later link to the smart vehicles which will be essentially provided by the private sector.

Now, actually the work on ATMS systems did not start with the beginning of the national IVHS program, but actually the research and development and some implementation has been going on for a number of years, and we have a number of examples around the country of the application of this type of technology. Of course, the applications that I am most fanatic with, and I will comment on briefly, are in the Los Angeles metropolitan area.

Within the city of Los Angeles, we have under way at the present time a major program to implement an ATMS type system for the entire city—3,800 traffic signals; a program involving $250 million due to be completed by the year 1998. This system was initially implemented in a first phase to help to support our transportation program and planning effort during the Olympic games. It performed admirably during that period of time and has been gradually improved since that date.

We have evaluated it on several occasions, because that has been very important to the local decisions as to this rather large scale implementation and have found that in our most recent implementations, that compared to existing systems that it has been replacing that we have been reducing delays and stops to vehicles on the order of 40 percent. That we have very importantly for the Los Angeles area—which is a nonattainment area—we are estimating that we are reducing air emissions due to the smoothing out of flow by the reduction of unnecessary stops—that we are reducing air emissions by 14 percent and indeed we feel that those estimates, given the reduction in stops, are probably conservative and that the air emissions' benefits are probably greater. Our estimates benefit cost ratio is $38 of benefit for every dollar of expenditure. So we believe in Los Angeles that the ATMS component is a very good investment compared to other alternatives.

A second project that has, I believe, a great deal of national interest is what we call the Los Angeles Smart Corridor Project. And this is going to be a project which will link together multiple agencies because one of the major problems at the local level is the fragmentation of transportation authority among many agencies; State, regional and city agencies and our Smart Corridor Project is an attempt in Southern California to link together all of these agencies using the most advanced technologies that are currently available so that all of these agencies will have the same view of traffic conditions and will be making decisions on those traffic conditions and will be provided the tools to actually provide a coordinated response to those traffic conditions.

Just to give you an example, in L.A. County alone we have 88 different local jurisdictions that have authority over various traffic operational matters.

A third project that we have going in the Los Angeles area of national interest is one of the 16 operational tests that was approved as part of the IVHS program in the ISTEA legislation. This is an operational test of a very advanced communication technology known as "spread spectrum." Interesting, it is a transfer of technology that was developed for the Defense Department and is being transferred now to the public sector, and we have high hopes that it offers the possibility of significant reductions in the cost of deployment of ATMS systems in the future.

With the work that has been going on for a number of years, we are now in the IVHS community turning our attention to deployment. The goal of the IVHS program is to deploy 50 advanced traffic management systems in metropolitan areas and 25 systems, ATMS systems, for inner city corridors by the year 2001.

Now, this is going to involve a rather large wrap up in the amount of funding if we are going to meet those particular goals. It has been estimated by the Federal Highway Administration that the level of funding that could be needed by fiscal year 1996 could be in the range of $800 million additional in ISTEA monies.

My concern on the deployment of ATMS technologies is in the current division-making structure of the ISTEA bill. Certainly while the flexibility that it provides is laudable, it has inherent in it a danger of a patchwork type of implementation throughout the country. ISTEA does have provisions in it in the planning functions, most notably the management plan, to shape the division in the direction of IVHS-type of programs, but nevertheless, I think that deployment is an area where we have to monitor very closely to ensure that we are not getting a patchwork type of implementation throughout the Nation because it would detract not only from the operation of ATMS systems in metropolitan areas but would detract from the overall IVHS program. Because with a patchwork implementation, we would not have the information required for other elements of IVHS.

Another area that is very important in the implementation of the IVHS program at the local level is the operations and maintenance of these systems. The benefits to be achieved cannot be achieved unless these systems are operated and maintained to a very high level.

In this regard, in 1990 the Federal Highway Administration conducted a nationwide survey of representative systems at both the State and the local level. They found that of the 24 systems surveyed, that only two met their standards of operations and maintenance; 22, did not. This caused a great deal of concern at the Federal Highway Administration and they convened a panel, which I had the honor of chairing, to look at this situation.

We presented to the Federal Highway Administration a series of recommendations to deal with this nationwide problem because obviously what we were dealing with here were systems of a technology of somewhat less complexity than we will be dealing with in the future on the IVHS programs under the IVHS program. We made recommendations in staffs, procurement, organization. The FHWA in November of 1992 then proceeded with a plan of action to implement these recommendations.

Probably the most difficult problem for the local agencies with regard to operations and maintenance is funding of this particular function. There has been a longstanding process in this country that we fund these types of systems out of capital budgets that come from either Federal aid funding or a State gas tax; and a strict division is made, especially at the local level, where the operation and maintenance of these systems are typically funded from local funds.

And let me say that I see the prognosis of availability of general funds not good. It isn't good today and as I look at the trend in coming years, that the availability of funding for this type of a function is going to become less. And this is a serious problem that I think we need to deal with effectively.

I would suggest that we look to some of the provisions in ISTEA. And let me say that I believe that certain very important steps were taken in the ISTEA legislation to at least address a portion of this problem in that the surface transportation program allows for the use of ISTEA funds for operations. The national highway system program allows it for start-up costs and there is also provision in the CMAQ program for some operations' cost utilization with some limits.

In other words, I think that we need to look in the ISTEA legislation to possible amendment to open up this legislation to use of funds for maintenance purposes on these IVHS systems if we are to have the future confidence that we have the funding streams to maintain these systems.

I know of a number of cases throughout the country where there has been reluctance on the part of local agencies to take on a new systems project, ATMS-type of project, because of the lack of assurance that there will be the funds to properly maintain and operate these systems in the future. And I think we need to deal with that problem.

Let me say also that the Europeans have recognized that this was a problem some years ago. And they have not created this artificial distinction between capital operations and maintenance. Once a project is approved, then there is some assurance that after that date from the same source of funds that there will also be funding for the operations and maintenance of those systems and they are operated and maintained very well in Europe, from our experience.

In conclusion, I would like to say that we have made some very substantial progress in developing technologies for ATMS. And I would not be remiss to say that the FHWA has played a central role in that over the years up until the current IVHS program. But that we now need to look to deployment, operations and maintenance, and we need to take whatever steps are necessary that we do not end up with a patchwork implementation across this country and that we properly maintain our systems because we are going to be making a multibillion dollar investment in the systems.

Mr. Carr. Thank you.

[The prepared statement and biography of Mr. Rowe follow:]

NATIONAL IVHS PROGRAM
RECENT DEVELOPMENTS AND CURRENT ACCOMPLISHMENTS

Statement Presented To The

House of Representatives
Committee on Appropriations
Subcommittee on Transportation
and Related Agencies Appropriations

Honorable Bob Carr, Chairman

By

Edwin Rowe
General Manager (Ret)
Los Angeles Department of Transportation

April 15,1993

Mr. Chairman and Members of the Subcommittee:

I am pleased to have this opportunity to testify before your Subcommittee regarding recent accomplishments and current developments in Intelligent Vehicle Highway Systems. My comments will be directed primarily at the current status and potential of IVHS at the local level of government and in some cases will also apply to State agencies. In these comments I will draw from my 35 years of experience with the Los Angeles Department of Transportation, the last five years of which was in the position of General Manager prior to my recent retirement. As a member and officer of IVHS America, the Institute of Transportation Engineers, and the Transportation Research Board, I have also had many opportunities to observe and discuss IVHS related issues in other State and local jurisdictions throughout the nation.

BACKGROUND

Over the past several years, a national IVHS Program has been established. Research and development funding for IVHS is incorporated into ISTEA and Strategic Plans have been prepared by IVHS America and the U.S. Department of Transportation. The strategic plans recognize the critical role to be played by state and local governments in the national IVHS Program. In particular, the deployment, operations and maintenance of Advanced Traffic Management Systems (ATMS) on the freeways and surface streets of this nation will in most cases be the responsibility of state and local transportation agencies. The "smart highways" that will result from ATMS are a basic building block of IVHS that provides the public infrastructure necessary to link with "smart vehicles".

Given the importance of the ATMS element of IVHS to achieving the goals of the overall program, the ability of local agencies to perform their specific tasks is a major concern. The focus of this presentation will be on the progress of local agencies of government in the IVHS program and issues that should be addressed in order to insure future successful performance.

While some of features of Advanced Traffic Management Systems are currently in the R & D stage, certain basic functions have been deployed and operated at various levels of sophistication by local agencies since the 1960's. At its most basic level, an ATMS involves the monitoring of highway traffic conditions, the operation of a centralized traffic control center, and the real-time response to congestion producing traffic conditions. These earlier efforts were made possible to a large extent by available Federal Aid transportation funds and technology developed as part of the FHWA's R & D program. During the 1980's substantial improvements in traffic management systems became possible with the rapidly expanding capabilities and declining costs of electronic, computer, and communications technologies.

THE LOS ANGELES AUTOMATED TRAFFIC SURVEILLANCE AND CONTROL (ATSAC) SYSTEM

A major demonstration of the traffic management benefits of the newly available technologies applied to advanced traffic management occurred during the 1984 Olympic Games in Los Angeles. The first phase of the City's Automated Traffic Surveillance and Control (ATSAC) System was implemented just prior to the Olympics. It provided previously unavailable capabilities to monitor traffic conditions as they occurred and to respond immediately as might be necessary to minimize congestion. The availability of ATSAC contributed importantly to the overall effectiveness of our traffic management activities during the Olympics, much to the surprise of the news media who had predicted a regional traffic gridlock.

Since 1984, several quantitative evaluation studies have been performed comparing ATSAC with the existing signal system operation which it replaced. The studies in the most recently completed areas indicated that travel time was reduced by 18%, signal delay by 44%, vehicle stops by 41%, air emissions by 14%, and fuel consumption by 13%. An economic analysis of the benefits concluded that they exceeded costs by a ratio of 38:1. Furthermore, A recent study suggests that the air emission benefits may be much larger than previously estimated, due to the significant reductions in stop and go driving. If these air emission benefits are confirmed, the implementation of Advanced Traffic Management Systems in air quality impacted urban areas could be a more important factor than previously assumed.

A citywide program to implement ATSAC at 3800 signalized intersections is underway at an estimated cost of $256 million. There are currently over 800 traffic signals under ATSAC control with a total of 1600 expected to be operational during 1994.

The Federal contribution to the funding of the ATSAC program has been about 55% so far. A combination of State Gas Tax, Developer Fees, and the Petroleum Violation Escrow Account have contributed to the remainder of the ATSAC construction program. For the future, utilization of ISTEA funds will be critical to the completion of the ATSAC program by the planned 1998 date.

Los Angeles DOT was recently selected by the FHWA as one of the sixteen applicants to receive funding for a project under the IVHS Operational Test Program. The Los Angeles project involves the testing of wireless Spread Spectrum Radio technology as a replacement for underground communication cables in Advanced Traffic Management Systems. In addition to lower costs, Spread Spectrum Radio does not require a FCC license for scarce communication frequencies. The current experience in Los Angeles has been that 43% of the cost of the ATSAC Program involves the installation of communication cables which requires trenching in the streets at a cost of $26/foot. These high costs have impeded a more rapid deployment of the system.

THE LOS ANGELES SMART CORRIDOR PROJECT

The success of the ATSAC program led to the Smart Corridor Project. This is a project of national significance which will demonstrate the feasibility and benefits of joining together a number of transportation agencies, both state (Caltrans and CHP) and local (LADOT, LAPD, LACTC, Beverly Hills, Culver City, and SCRTD) to cooperatively improve the management of traffic.

Construction of the $48 million Smart Corridor Project is scheduled for the end of this year and will encompass a 14 mile corridor composed of the Santa Monica Freeway and five parallel arterial streets. The design utilizes the most advanced technologies currently available. An extensive communication network utilizing fiber optics and radio will link control centers with each other and with highway sensors, video surveillance, traffic signals, ramp meters, emergency response teams, freeway service patrols, and public safety vehicles. To improve the ability of drivers to make intelligent travel choices, real-time traffic information will be provided over a wide range of media in addition to distribution to commercial radio and TV. These complementary information sources include: changeable message signs on both the freeway and arterial streets, low power highway advisory radio, highway advisory telephone, teletext, and community access cable television. To ease the load on control center operators and improve the quality of traffic management decisions, a real-time Expert System is being implemented.

By cooperating together in the Smart Corridor Project, the eight participating operational agencies will all have access to the same unified view of traffic conditions and the measures that have been implemented to manage traffic. This contrasts to the current fragmented incomplete view available to each agency which sometimes results in conflicting responses.

Interagency cooperation will also involve the development of joint traffic response plans. The availability for immediate call up of these pre-designed plans in the Smart Corridor Control Centers will save valuable time in responding to a wide range of incidents affecting the highway network. It has been estimated that for every minute that is saved in responding to an incident, four minutes are saved in recovery time back to normal traffic flow conditions.

After the evaluation of the Smart Corridor Project is completed in 1994, it is anticipated that this approach will be utilized throughout Los Angeles County and elsewhere in California where it has been estimated that 440 miles of freeway corridors would benefit from consolidated state/local traffic management systems.

We believe that the Los Angeles Smart Corridor Project is of national significance since it addresses the common problem of fragmentation of authority for transportation management actions among a large number of state and local agencies in a metropolitan area. For example, in Los Angeles County there are 88 cities, the majority of which have their own traffic/transportation, police, and fire departments. Effective traffic management in urban areas will ultimately require the close coordination in a timely manner by the various jurisdictions that have specific operational responsibilities.

NATIONAL DEPLOYMENT OF ADVANCED TRAFFIC MANAGEMENT SYSTEMS

The IVHS program within ISTEA is serving to accelerate the research and development of IVHS products. In order to achieve the goals of the national program, however, it will now be necessary to give added attention to the deployment of major IVHS elements. In this regard, special attention needs to be given to the deployment of Advanced Traffic Management Systems within major urban areas, since they serve as the basic "smart highway" building block for the IVHS program as well as providing substantial congestion relief and air quality benefits.

The IVHS program goal is to implement 50 ATMS in metropolitan areas and 25 intercity corridors by the year 2001. It is estimated that achieving this goal will require additional ISTEA funding on the order of $200 million in FY 94 rising to between $600 and $800 million in FY 96 and beyond. These Federal investments in IVHS deployment will serve to leverage funding from other sources at the state and local levels of government.

There is no categorical program within ISTEA for the funding of IVHS deployment. ISTEA provides considerable flexibility to state, metropolitan, and local agencies in the allocation of funds to transportation projects. Certain mechanisms within ISTEA should help to support IVHS deployment funding decisions. These include the requirements for management systems in the areas of congestion, public transit, intermodal facilities, and safety. Nevertheless, the adoption of the national IVHS vision and priorities by the State and local levels of government is not a certainty and the ramp-up in ATMS funding envisioned could fall short of the accelerated schedule envisioned. The result would be a "patchwork" highway IVHS infrastructure deployment throughout the nation that could have serious consequences for the remainder of the program. Contingency plans for dealing with such an outcome should be developed. Consideration should be given to establishing a categorical program within ISTEA for IVHS deployment and/or further incentives for State and local agencies to allocate ISTEA funds for this purpose.

OPERATIONS AND MAINTENANCE OF ATMS

A major institutional issue facing the IVHS program involves the operation and maintenance of Advanced Traffic Management Systems by state and local agencies. Unless the ATMS element of IVHS is operated and maintained at a satisfactory level, performance of other elements will be adversely affected.

In 1990, the FHWA conducted a review of 24 representative traffic management systems implemented by State and local agencies. It was concluded that all but two of systems were not being operated and maintained at a satisfactory level. These findings are of major concern since the systems reviewed were not as complex as those that will be deployed under the IVHS program.

An expert panel convened by the FHWA confirmed the conclusions of the earlier study and developed recommendations of actions that will be required at the Federal, State, and local levels to provide for adequate performance of operations and maintenance functions in the future. In November of 1992, the FHWA issued a "Plan of Action" based on the recommendations of the expert panel. Work has already begun on the implementation of the recommendations which involves the following areas of concern: funding, staffing, training, organization, design, technology transfer, procurement, and interjusidictional coordination.

Probably the most difficult problem related to operations and maintenance is funding. Typically, local agencies have implemented traffic management systems with capital funding derived primarily from State and Federal gas tax sources. Operations and maintenance of these systems has been usually financed from general fund sources. The FHWA expert panel report stated the following:

> "A smoothly functioning high quality operations and maintenance program requires a predictable long term source of funding that is not subject to the yearly variations in state/local general fund budgets.
>
> The common experience of state and local agencies is that while funding for design and construction of traffic control systems may often be sufficient, funding for operations and maintenance is usually inadequate to meet even minimal requirements. In particular, Federal Aid Urban funds have been used for the implementation of traffic control systems with no requirement for matching funds. Funding for "system start-up" costs including operations and maintenance was allowed for a limited period under the old Act and will be extended to two years under the ISTEA for projects in the "National Highway System" funding category. For projects funded under the "Surface Transportation Program" ... operating costs for traffic control systems are allowed indefinitely...

> While it has been suggested that state and local agencies commit to the long term operations and maintenance of traffic control systems as a condition of obtaining federal funding for implementation, this will be difficult to achieve without some amount of Federal gas tax assistance. Increasing costs of maintaining roadways and bridges is crowding out other uses of state gas tax funds, such as for traffic control systems which typically receive a lower priority. Use of state or local general funds for operations and maintenance of traffic control systems is even more constrained, since effective competition with various rapidly growing "entitlement" programs and public safety programs is virtually impossible politically.
>
> Unless new funding mechanisms are found, it is highly likely that the deficiencies in the operations and maintenance of traffic control systems noted in the FHWA's survey will continue and worsen as more systems are built. This will present an untenable situation for the future of the IVHS program, which will to a large extent depend upon properly operating traffic control systems as a basic building block."

Certain provisions of ISTEA are a good start at addressing the problem of operating and maintaining the advanced traffic management system element of IVHS. Two years of "startup" costs are allowed for traffic management type projects funded under the National Highway System -- under the previous legislation only capital costs were eligible for Federal funding. Under provisions of the Surface Transportation Program, "operating" costs for traffic management systems can be funded indefinitely. The Congestion Mitigation and Air Quality Program allows for two years of operating costs.

A tour of European traffic management systems revealed a different approach to funding operations and maintenance. A sharp distinction between the sources of capital and operations/maintenance funding was not made once a project was approved for implementation. This appeared to better insure the continuing availability of adequate operations/maintenance budgets than is typically the case in the United States. Consideration of the European policy in this matter would be desirable with regard to future U.S. transportation legislation.

Given the high priority that Advanced Traffic Management Systems have in providing an adequate transportation system for the 21st century, it is essential that we insure that they will be operated and maintained properly. The FHWA Action Plan should deal effectively with most of the issues identified relative to this objective. Adequate funding at the local level remains, however, very uncertain even with the increased latitude provided under ISTEA. Therefore, it is strongly recommended that ISTEA be amended to allow for both operations and maintenance funding of Advanced Traffic Management Systems on a continuing basis from all applicable program sources.

CONCLUSION

Important progress is being made in one of the basic building block elements of IVHS -- Advanced Traffic Management Systems. An early example of the application of this technology in the Los Angeles ATSAC System has demonstrated significant benefits in reducing congestion, air emissions, and fuel consumption. The Los Angeles Smart Corridor Project, which is nearing completion of the implementation phase, will demonstrate the benefits of utilizing advanced technologies to facilitate interagency coordination of traffic management activities on a regional basis.

The IVHS Program under ISTEA is providing necessary funding to accelerate the research, development, and operational testing of newer technologies that will provide even more advanced capabilities and in some cases lower deployment costs.

In order to achieve the goals of the national IVHS Program, it will be essential to now accelerate the deployment of the necessary highway infrastructure required to support the Advanced Traffic Management System element. The flexibility allowed to state, regional, and local transportation agencies in allocating ISTEA funds could lead to a "patchwork" national deployment. The need for establishing a categorical program under ISTEA or additional specific incentives to achieve funding IVHS deployment goals should be considered.

It will be necessary for Federal, State, and local transportation agencies to implement a number of changes relative to staffing, training, organization, technology transfer, and procurement to correct existing problems and provide for the higher levels of operations and maintenance that will be required for the Advanced Traffic Management System element of IVHS. The recommended changes are contained in a recent FHWA Action Plan.

Provision of appropriate levels of funding for operations and maintenance of Advanced Traffic Management Systems remains uncertain due to the declining availability of State and local general fund sources for this purpose. Amendments to ISTEA will probably be needed to allow for allocation of continuing Federal funding for operations and maintenance once an Advanced Traffic Management System project has been approved for implementation.

BIOGRAPHICAL INFORMATION SUMMARY
Edwin ROWE

- Consultant, Transportation Engineering, Intelligent Vehicle Highway Systems
- General Manager, City of Los Angeles Department of Transportation, 5 years, Retired 02/28/93
- 35 years with the City of Los Angeles Departments of Traffic and Transportation
- The Department of Transportation serves as the focal point for the planning, coordination, management, and operation of the City's various transportation-related activities. It has over 2,000 employees, an annual operating budget of $113 million, and $80 million in annual contracts.
- Mr. Rowe's major achievements include direction of the design and development of the ATSAC computer-controlled traffic signal system, directing City participation in the Smart Corridor Project, direction of planning and implementation of the Department's Olympic Games Transportation Program, and establishment of specialized bus services for City residents. The ATSAC Project has been selected as a winner of the Innovations in State and Local Government Award, a Program sponsored by the Ford Foundation and Harvard University JFK School of Government.
- Mr. Rowe has received numerous awards including the City Employee of the Year for 1989, the Institute of Transportation Engineer's Theodore M. Matson Memorial Award for outstanding contribution to the advancement of the science and profession of Traffic Engineering, finalist in the American Public Works Association's 1991 Top Ten Public Leaders of the Year, and election to the Institute for the Advancement of Engineering College of Fellows (1991).
- Graduate of USC - Bachelor Engineering
- Graduate of UCLA - Master Engineering, Engineering Executive Program
- Registered Professional Engineer
- Member of the Institute of Transportation Engineers and Vice Chairperson of the ITE Council on Intelligent Vehicle-Highway Systems.
- Member of Transportation Research Board IVHS and Traffic Signal Systems Committees
- Member of the Board of Directors, Executive Committee, and Secretary of the Intelligent Vehicle Highway Society of America
- Consultant to Federal Highway Administration on IVHS Deployment and Public/Private Sector Issues.
- Co-Chairman of Engineering Foundation Conferences on Traffic Management
- Instructor, ITE Course on IVHS
- Guest Lecturer, Texas Transportation Institute Course on Transportation Information and Control Systems Design

STATEMENT OF RICHARD BRAUN

Mr. CARR. Mr. Braun?

Mr. BRAUN. Thank you, Mr. Chairman.

My name is Dick Braun. I am director for the Center of Transportation Studies at the University of Minnesota and former head of the Minnesota Department of Transportation. Jim Denn, who is the commissioner of transportation in Minnesota, and I chair the Guidestar Executive Committee and that is the Minnesota IVHS effort and we are very happy to see how this multifaceted program is moving forward.

On behalf of the center and the Minnesota Department of Transportation, I am happy to respond to your invitation for several reasons. We are indebted to you, Mr. Chairman, and also to your committee and our Congressman Martin Olav Sabo, for your continuing good faith and support.

I, too, have a prepared statement, a formal paper, and that provides additional information so I will be summarizing.

I would like to cover two broad categories here. First, to hitchhike on something that Ed Rowe said as it related to organizational structure and the importance of organizational structure in the projects that we have put forth so far and show you how that ties in. I also want to thank you for taking time this morning to stop at our Guidestar booth in the exhibit area here. We appreciate you doing that.

The second point that I would like to make has to do with a device that is created and developed at the University of Minnesota called Autoscope. That, too, is involved with your Oakland County projects. So we have a strong tie to you and your Committee.

As we formed our IVHS program—and this occurred before the formal introduction of IVHS on a national level, we set Guidestar up earlier than that—we felt this was really a very exciting technology. Some of us were around when the interstate system was conceived and started and really thought that was about the most exciting thing that was going to happen in our career; locate and design a system. But if you look at what occurred then in the metropolitan areas, the highly congested areas with the complicated urban design, they pale I think in comparison to the challenges and opportunities that are out there for transportation people in the IVHS field.

So I would like to make a couple of general comments about organizational structure because I feel strongly about this. As we set Guidestar up, we found out quickly that we needed a structure that involved all units of government. I at that time represented the State government. Ed is local, so I am sort of reinforcing what Ed has said about that as well. But it is important that all units of government are involved. Guidestar set up an executive committee and a steering committee which you would normally do but I think the breadth of the involvement is illustrated by the membership of our overall committee.

Commissioner Denn and I chair that, but it includes the chairperson of the Metropolitan Council, the executive director of the Metropolitan Transit Commission, the chairperson of the Regional Transit Board, the division administrator for the Federal Highway

Administration, the commissioner of Public Service, the commissioner of Public Safety, and all of these people attend the executive committee meetings.

They feel strongly that IVHS is a good program for our twin city area and the entire State. But more importantly, all units of government are involved and attend. The director of Public Works of the city of St. Paul, the county administrator for the county, the city engineer for the city of Minneapolis all are people that are not only part of our group but this latter group I think enhances our ability to make Guidestar a success.

So I am enforcing what Mr. Rowe has just told you. In our IVHS research program in development we have several complementary elements. The University of Minnesota has its IVHS research project. We have created an IVHS Institute at the Center for Transportation Studies. That will very soon breed an IVHS lab and then we have other programs. So I would like to emphasize two of those.

Thanks to your Committee and Congressman Sabo and Congressman Oberstar, the University of Minnesota was able to obtain a million dollars a year for six years to create this IVHS Institute. That is a primary objective of ours then to conduct research and recommend development activities which would increase road capacity, and I think I would like to emphasize, more importantly, enhance the safety aspect as well as reduce the negative environmental affects. So as part of this we will have the lab. That is getting started. We have hired a director and we are on our way to implementing a program.

I would like to describe briefly two of our Guidestar projects. These are two of the projects that are included among the 16 that were currently authorized by the Federal Highway Administration and you will see then how this ties into transit and the other elements.

The first is called Genesis, which has the objective to examine the market and technical potential of an advanced traveler information system that provides real time travel data via the personal portable communications device, PCD it is called, and it has several objectives. Maximize the use of existing transportation systems by reducing the level of congestion and do this through the use of transit. A key element will make real time information available to the users and do operational tests.

You in your remarks talked about public-private partnerships. In this case our private partnership is Motorola Corporation and they are going to provide the technical support and supply the portable communications device so we can test them and evaluate them in our Human Factors Lab at the university. The key issue here is the demonstration in providing real time traffic data to a personal portable communications device in order to enhance the use of transit.

The other project that has been approved is called TRAVLINK. Its objective is to evaluate the effectiveness of enhanced transit information systems in influencing commuter mode choice and decreasing single occupancy automobile travel. And the key elements are similar: Provide real time automatic vehicle location so you know exactly where the vehicle is; advanced vehicle communication to the metropolitan transit center; advanced communication between the MTC and the transit users, and in this case US West is our private partner and we are working with them. They will be providing technical support and also donating 500 videotext terminals. Here are two real examples of projects that have a strong private tie and also are heavily involved with transit.

Our Guidestar program has as transit elements provisions for vastly improved information system. We think that is the key. If you can get the public to be more aware of the options that are available and the incidents that are occurring that could hamper their normal movement, we expect that that will increase the usage. These are just two examples, as I mentioned, of the projects that we have going under our Guidestar program.

And the second item that I would like to cover briefly has to do with Autoscope. We are very happy that Minnesota is the birthplace of Autoscope. That is the device being used in Oakland County, among other places, invented by Dr. Panos Michalopoulos at the University of Minnesota and the University of Minnesota holds the patent rights which is key to our future as well as it relates to funding for future research.

Briefly, instead of putting loops in the road, driving the car over the loops to detect the vehicles, you do it on the screen. The vehicles are on the screen and as the vehicles cross lines on the screen, you record the same kind of information. That is a very simplistic example of what else it can do, but with this you don't tear up the roads. You have many other options of information that can be detected and used in design.

Autoscope, again, is a real example of U.S. technology that is more advanced than the technology in Germany and the rest of Europe as well as in Japan, and I think that is a very important thing as it relates to the future of the United States and the high-tech part of IVHS.

I mentioned that in Oakland County some of the 28 intersections that you have as part of your experiment are tied in with Autoscope. We are very happy that that is occurring as well. Under the arrangements of Autoscope—I mentioned that the university owns the patent rights—of the money that comes back off the royalties, half of those come to the University of Minnesota's Center for Transportation Studies which we will use to perpetuate the research. This is a nice tie with the private sector and will benefit the University of Minnesota in several ways.

With that, Mr. Chairman, I would like to thank you for the opportunity to make this presentation on a very exciting and challenging subject and look forward to the questions.

Mr. CARR. Thank you, Mr. Braun.

[The prepared statement and biography of Richard Braun follows:]

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STATEMENT BEFORE THE

HOUSE APPROPRIATIONS SUBCOMMITTEE

ON TRANSPORTATION AND RELATED AGENCIES

Relating to:

THE IMPORTANCE OF INTELLIGENT VEHICLE/HIGHWAY SYSTEMS AND

RECENT ACCOMPLISHMENTS IN MINNESOTA

by

RICHARD P. BRAUN

DIRECTOR, CENTER FOR TRANSPORTATION STUDIES

UNIVERSITY OF MINNESOTA

April 15, 1993

Mr. Chairman, I am Richard P. Braun, Director of the Center for Transportation Studies at the University of Minnesota. Minnesota Commissioner of Transportation James Denn and I are also co-chairpersons of Minnesota Guidestar, our state's multifaceted IVHS program.

On behalf of our Center for Transportation Studies at the University of Minnesota and the Minnesota Department of Transportation, I am pleased to respond to your invitation asking for our testimony at this hearing as part of your panel discussing the technological aspects of IVHS. Minnesota is especially grateful to your subcommittee, and especially to you, its Chairman, and our congressman Martin Olav Sabo, for your continued faith in and financial support of our Guidestar program.

I would like to divide my remarks into three broad categories. First, I will be discussing the organizational structure and several projects contained in the program. Second, I would like to call your attention to the image sensing device called Autoscope™ invented at the University of Minnesota and currently being used in several areas throughout the country, including Oakland County, Michigan. The last item will be a brief general discussion of concerns I have about the non-technical requirements for fully implementing the Nation's IVHS program.

MINNESOTA GUIDESTAR

Minnesota formed its IVHS program under the name Minnesota Guidestar before the formal introduction of IVHS on a national level. In addition, I was a member of Mobility 2000, a 21-person group that met many times throughout the country in the late 1980s on this subject. When IVHS AMERICA was created in 1990, the committee structure of Mobility 2000, its predecessor, provided a basis for initiating the more formal arrangement we now have.

I find IVHS an exciting subject. High technology has finally moved into the transportation business. Some of us have been around long enough to have participated in the location and design of the interstate highway system from its inception. At that time I felt the interstate highway system would be the most exciting experience in my transportation career. It was very challenging to be responsible for locating and supervising the design of even a rural portion of the system. However, even the most complex urban designs and location decisions of the interstate era pale in comparison to the challenges provided today by the IVHS program.

First, some general comments about the organizational structure of Minnesota Guidestar. As our program evolved, program management and coordination become increasingly more complex. It quickly became evident that an organizational structure involving top-level people from all levels of government would be necessary for satisfactory program implementation. The ever-increasing diversity of program participants added to the complexity of this issue.

To make the program successful and achieve its goals and objectives, a framework to coordinate its development was established. At the center of this framework is a set of procedural guidelines that were developed by the key program participants. In particular, the Minnesota Guidestar Steering Committee has been responsible for establishing the policies relating to operational tests, project selection criteria, partnership policies, and guidelines for private sector involvement in the various committees. Members of the University of Minnesota Center for Transportation Studies have been responsible for establishing guidelines relating to research and development. As we proceed, we are more convinced than ever that a sound structural arrangement involving all units of government on a very high level will be required for full implementation of IVHS.

To implement this program we have formed a Guidestar executive committee, a steering committee, and several other committees for implementation. These include a planning and program management committee, a research and development committee, a transit innovations committee, a communications and navigations committee, and a freeway and arterial management committee. Although I realize this sounds as though it could be an overburden of committees, we feel this structure is essential.

The breadth of this involvement is illustrated by the membership of our overall Executive Committee. As I mentioned previously, Transportation Commissioner Denn and I co-chair this group. The Chairperson of the Metropolitan Council, the Executive Director of the Metropolitan Transit Commission, the Chairperson of the Regional Transit Board, the

Division Administrator for the Federal Highway Administration, and the Commissioner of Public Safety--each representing the top position in their respective organizations--all personally attend the Executive Committee meetings. This group also includes the Director of Public Works for the City of St. Paul, the County Administrator of Hennepin County, and the City Engineer of the City of Minneapolis, among other governmental units. It is this latter group that is going to enhance our ability to make the Guidestar program a success.

The Minnesota Guidestar approach is different from other IVHS programs around the country. Rather than focusing on the development and application of a single technology or approach, Minnesota Guidestar is seeking to develop a truly statewide intelligent transportation system. This is being accomplished through leading-edge research and development and operational tests of state-of-the-art technology. We are intent upon building multimodal solutions, creating consensus through public agencies in the state, as I previously mentioned, and developing systems for urban and rural needs. To do this requires fostering real partnerships with academia and the private sector.

IVHS research and development in Minnesota consists of a number of complementary elements. These include the following:

1. The University of Minnesota IVHS research program
2. The Mn/DOT research program
3. The IVHS Institute at the Center for Transportation Studies
4. The IVHS laboratory

5. The other University and CTS programs.

I will elaborate on just two of these shortly.

As I previously mentioned, Mr. Chairman, thanks to you and our Minnesota congressmen Martin Sabo and Jim Oberstar, the University of Minnesota was able to obtain $1 million per year for six years in the ISTEA legislation to create an IVHS Institute. A primary role of our new institute is to conduct research and recommend development activities which focus on methods to increase roadway capacity, enhance safety, and reduce negative environmental effects of transportation facilities through the use of Intelligent Vehicle/Highway Systems technologies. We have hired an Institute director and prepared an annual plan, and are well on our way to implementation.

As part of this program, we will soon have an IVHS laboratory at our Center for Transportation Studies. The laboratory is intended to be a state-of-the-art research and training facility which will receive traffic data directly from Mn/DOT's data collection network. A fiber optics network will connect the laboratory to Mn/DOT's Traffic Management Center in downtown Minneapolis, which manages the freeway system for the entire metropolitan area. Through this link, students and practitioners will be able to utilize real-time traffic data in their research and analysis activities. The lab will serve as an education and training facility to educate students in state-of-the-art IVHS technologies. It will also serve as a research center to allow researchers to conduct simulation studies and evaluate traffic control strategies. We will be able to simulate field operations before spending large sums on actual field demonstrations and deployment.

I would now like to describe briefly two of the Guidestar projects. These two projects are included among the sixteen recently approved by the Federal Highway Administration for its national IVHS program.

The first is called Genesis. Its objective is to examine the market and technical potential of an advanced traveler information system that provides comprehensive, real-time travel data via a personal, portable communications device. Genesis has several specific objectives which are to:

- Maximize the use of existing transportation systems by:
    - Reducing levels of congestion
    - Generating growth of transportation systems through increase in transit usage
- Make real time information available to users in the Twin Cities metro area
- Operationally test and evaluate effectiveness of PCDs
- Utilize an evolving family of devices similar to palmtop personal computers with wireless communication to collect and display information
- Encourage and sustain a viable and profitable US based IVHS technology
- Facilitate and increase the use of transit systems

The ISTEA legislation passed by your body strongly encourages public/private partnerships. In the case of Genesis, our private partner is Motorola Corporation, which will provide technical support by developing and supplying the portable communications device for operational testing. Other participants include the Federal Highway Administration, which will provide financial support and strategic input; BRW/JHK/Battelle, a consultant team selected to undertake the first phase; and the University of Minnesota's Human Factors laboratory, which will participate in the evaluation. We selected a consultant team that is now entering Phase I, concept definition and preliminary engineering. The key issue in this demonstration is providing real-time traffic data to a personal, portable communications device.

The second project approved for implementation by the Federal Highway Administration is called Travlink. Its objective is to evaluate the effectiveness of enhanced transit information systems in influencing commuter mode choice and decreasing single occupancy automobile travel. The key elements of TRAVLINK are as follows:

- Real-time Automatic Vehicle Location (AVL)
- Advanced vehicle communications to the Metropolitan Transit Commission (MTC) operations center
- Advanced communications between MTC and transit users applying US West's Community Link, audiotext, and terminals, in offices and transit stations
- Ability to support future applications

I am personally convinced that in order to make IVHS a success, we have to focus more on the transit and safety aspects of the program. The major partners in this project are as follows. Mn/DOT will be the project leader and provide technical and financial support. Our private partner is US West, which will provide technical support and donate 500 videotext terminals for operational testing. Other participants include the Federal Highway Administration, which will also provide financial support and strategic input, and the Federal Transit Administration, which will provide financial support through a grant. Strgar-Roscoe-Fausch, a Minneapolis consulting firm, will serve as project manager; Colle and McVoy will conduct marketing research; and the University of Minnesota will participate in the evaluation. We have selected a consultant and Phase I is under way.

The above are just several of the many IVHS projects currently under consideration in Minnesota.

AUTOSCOPE

Minnesota is proud to be the birthplace of Autoscope™, a device used, among other things, to monitor traffic. Autoscope was invented at the University of Minnesota by Dr. Panos Michalopoulos, and the University holds the patent rights. Image Sensing Systems, a St. Paul company, was formed to commercialize this product, and Econolite Control Systems in California is marketing the project in the United States.

Autoscope addresses one of the problems of providing real-time data for IVHS--the lack of instrumentation for measuring and monitoring traffic. The reliability and accuracy of existing equipment is questionable. Currently, loops in pavement are used most frequently. However, these loops are costly, they have maintenance problems, and are unable to measure queues and traffic concentration. In our opinion, detection was the weakest link for advanced traffic surveillance and control. The technology exemplified by Autoscope is called video imaging, and its components are a video camera plus specialized hardware and software for analyzing images. Advantages include wireless detection, which allows for low maintenance; and simple installation, which eliminates the need for disrupting traffic because there are no devices in the roadway itself. Thus, traffic managers are able to quickly change and reconfigure the detector placement at no cost. Vehicles are counted as the image of the vehicle crosses lines preconfigured on the video screen. Nothing is done in the roadway itself.

Autoscope is a real example of U.S. technology that is more advanced than that in Japan and Europe. It is also a real example of public/private cooperation. Again, Congressman, thanks to your effort, some 28 intersections in Troy, Michigan are currently under surveillance with Autoscope. The system has worked virtually flawlessly since June of last year, and it is in the process of being expanded to over 200 intersections. The device is also used in other U.S. cities and in Europe.

Well, so much for the commercial. My main ulterior motive, as I mentioned previously, is that the University of Minnesota controls the royalties on this product. Half the royalties will come to the Center for Transportation Studies, which I direct, to continue further research. In the last two years, the University has earned almost $200,000 in royalty fees, and the amount is increasing each year. This project has been taken from concept to product in about eight years. Obviously, then, it precedes the start of the national IVHS program, and it turns out to be the right product at the right time.

NON-TECHNICAL ASPECTS OF IVHS

In closing, I would like to just say a few words about the non-technical aspects of IVHS. Those of us who have been involved since the days when it was called Mobility 2000 quickly recognized that in order to enhance the opportunity for full implementation, it would be necessary to concentrate on the less technical aspects. As IVHS AMERICA was initially formed, the committee structure from Mobility 2000 was folded into the program. The Coordinating Council, which I chair, decided to create two new committees, one for institutional issues and another for legal issues. These two committees have been very active the past couple of years, and will enhance our opportunities for implementation. I mentioned initially many units of government will be involved. I am sure that other speakers will comment on these subjects as well.

Thank you for the opportunity to make this presentation on an exciting and challenging subject. I look forward to our question-and-answer session following these presentations.

RICHARD P. BRAUN
DIRECTOR

CENTER FOR TRANSPORTATION STUDIES
UNIVERSITY OF MINNESOTA

Before being appointed Director of the Center for Transportation Studies, Richard Braun was Minnesota's Commissioner of Transportation for eight year under both a Republican and Democratic governor. Prior to that time, he was Deputy Commissioner of Operations in the Minnesota Department of Transportation since the creation of MN/DOT in 1976. For the previous six years, Braun had been a Vice-President and Principal Associate in Barton-Aschman Associates, a nationally known transportation and Planning firm.

He has spent virtually his entire professional career in transportation related activities. For the past 25 years he held technical and management oriented positions in both the public and private sector. Braun holds both a Bachelor and Masters Degree in Civil Engineering from the University of Minnesota. Braun has received numerous state and national awards including being named one of the ten outstanding public works leaders in the country in 1981. He has been a member of the Executive Committee of the National Transportation Research Board and is a past president of the American Association of State Highway and Transportation Officials. In 1989 he was honored by the Minnesota Society of Professional Engineers by being named Minnesota's Engineer of the decade for the eighties.

At the University of Minnesota Center for Transportation Studies, he is responsible for coordinating transportation research activities. In addition to his duties as Director of the Center, he is responsible for the Intelligent Vehicle Highway System Program. Braun was a charter member of Mobility 2000, the forerunner of IVHS AMERICA. In IVHS AMERICA, he is a member of its Board of Directors and Executive Committee, and also, the first Chairman of the 49 person Coordinating Council, which oversees the work of the technical committees and subcommittees.

Braun is co-director of Minnesota's *Guidestar* program, a joint program between the Minnesota Department of Transportation and the University of Minnesota. This partnership, including other public and private organizations, serves as the framework for organizing and coordinating IVHS research, development, and deployment in Minnesota.

4/93

STATEMENT OF FREDERICK TUCKER

Mr. CARR. The next witness is Frederick Tucker. Welcome to the Committee.

Mr. TUCKER. Mr. Chairman and Members of the Subcommittee, it is a pleasure for me to be here today. I am Fred Tucker from Chicago, Illinois, and I am Executive Vice President of Motorola and general manager of their automotive and industrial electronics group. I also serve as the chairman of the Strategy Review Board for Motorola's intelligent vehicle highway systems' strategic business unit. This business was formed in 1988 to focus Motorola's capabilities on the development and implementation of advanced vehicle highway technologies. So it was with great interest that I received your invite.

It is an honor to share some of the issues we see as the Nation moves forward in its agenda to improve our transportation system.

The potential benefits of IVHS have been discussed at great length and in many forums over the past several years. IVHS offers the American public an opportunity to reduce traffic congestion, improve safety, reduce air pollution, and fuel consumption, and improve the efficiency of the Nation's commerce. In addition to greater public well being, these factors lead to greater productivity and enhanced competitiveness of our Nation as a whole.

As a corporation, our interest in IVHS also is straightforward. Advances in communications, computers, and control process technology make the realization of IVHS systems a near-term possibility. That presents my company and others with the opportunity to participate in an emerging market of great significance.

Four years ago, Randy Doi, Motorola Vice President and director for our IVHS business, gave testimony before the House Subcommittee on Transportation, Aviation and Materials on the matter of IVHS. Mr. Doi noted that extensive activities in Europe and Japan demonstrate our confidence in the promise of IVHS is shared on a worldwide basis.

In these countries, vehicle manufacturers and electronics companies with the cooperation of their local governments have invested heavily in these types of systems since the mid-1980s. Here in the United States we came into the game much later than the other players. Mr. Doi cautioned that continued advancements in foreign IVHS programs presented this country with a special challenge to move forward rapidly to avoid the potential loss of yet another technology-based opportunity to foreign competition.

He cited several factors that were critical for the U.S. to take a competitive position in the market. The most important factor was clear national leadership; leadership that could forge the necessary partnership between the public and private sectors to make IVHS a reality.

Much has happened in the past four years that bodes well for the Nation's future in IVHS. IVHS America was formed as an advisory body to the U.S. Department of Transportation with responsibility for coordinating IVHS's efforts in the United States. The progress IVHS America has achieved thus far is significant. And its influence throughout the worldwide IVHS community continues to grow as evidenced by the tremendous attendance at this third annual meeting of ours.

By enacting the Intermodal Surface Transportation Efficiency Act of 1991, Congress provided critical strategic direction for the drive toward a more efficient transportation network. Equally important, the act provides essential funding for the research needed to define concepts and set standards that will allow the deployment of IVHS in this country.

Numerous demonstration projects and field tests are in various stages of development and the working groups of IVHS America continue to make progress across a range of issues that will determine the nature of advanced technological solutions.

We are beginning to identify and understand the system requirements that are necessary to set the standards so they will be compatible nationwide. Clearly, there is great cause for optimism. We have made good progress and in a remarkably short period of time we have narrowed the gap between the United States and other global efforts. However, we still have a long way to go. And our greatest challenge as a Nation is to maintain our momentum.

The United States has the potential to take a leadership position in the development of advanced transportation technology. But we aren't there yet and our only chance is if the support continues. We are at a critical stage.

Based on early progress, we risk becoming complacent when the major share of the task remains to be done. We need to be sure that the ISTEA funding remains available for IVHS so that we can do the research and development to adequately test and define the system.

Although we are behind our international counterparts, we have an advantage if we only use it. Other regions have outspent us, but their efforts have been fragmented by competing technological approaches and political agendas. In contrast, the United States chose wisely to focus its efforts. Certainly we also are examining a wide variety of alternatives. However, we share a common purpose, an agenda through the direction of IVHS America and the policies of ISTEA. Our single greatest challenge is to maintain this course and move forward at an aggressive pace. To slow down now would present unacceptable risk for both the public and private sectors in America.

The Nation as a whole would have risked achieving the benefits of IVHS in a timely manner and over the long term we would face the potential of losing yet another key technology market. The private sector faces a distinct competitive disadvantage in a worldwide market for IVHS if it must compete against better funded adversaries in Europe and Japan. If the U.S. pulls back now, foreign competition will speed ahead.

It is worth noting that before the current economic recession in Japan, one Japanese automaker was shipping up to 12,000 in-vehicle navigation units per month. On a more fundamental level, many of the key components of IVHS, like compact disk players and liquid displays, are controlled by the Japanese. Clearly, there is a lot at stake for all of us. Against this backdrop I believe that continued funding is a prerequisite for achieving our national IVHS agenda.

There are several other key issues that will determine our ultimate success. The first is that we need to develop mutual trust between the public and private sectors; the confidence that each of us will step forward and do our part.

On one hand the public sector is understandably reluctant to invest limited public dollars in IVHS infrastructure if the in-vehicle systems aren't there so that the public can use it. On the other hand, manufacturers are reluctant to invest and put systems in vehicles if the infrastructure isn't in place to deliver significant benefits to our customers. It is a classic chicken and egg scenario. We both need to demonstrate significant ongoing commitment on IVHS so that we can come together with shared confidence.

Closely related to this is the need to achieve effective public-private partnerships. IVHS is breaking new ground in testing the flexibility of all participants. Private sector participation currently is discouraged by a procurement process that is cumbersome and we need to accelerate our learning in this area. Our shared objective should be to streamline the procedures that add value and eliminate those that simply add time and money to the process. IVHS America is taking a lead in examining the key areas where resolutions need to occur and some legislation may be necessary to accomplish this task.

In closing, I believe that the United States is capable of making the promise of IVHS a reality. Certainly we face significant challenges and I have outlined several of those issues for you today. Yet the decision to move forward is ours to make. Already the U.S. has taken major steps towards achieving our national agenda for IVHS through ISTEA and IVHS America, we have a solid framework for commitment and focus and I believe that viable technology is in place that is capable of meeting the Nation's needs. It is more a matter of how much we spend and how fast we push that process.

On Motorola's part, we believe that it is worth the effort. Further, we have backed our belief with millions of dollars of investment and our ongoing commitment to be a full participant in the U.S.-IVHS community. It is our intention to be a supplier of in-vehicle systems as well as a provider of communications technology. We believe that the United States is capable of developing and implementing an effective nationwide IVHS system. We see the benefits and the opportunities of IVHS and with your continued leadership we are optimistic that the United States will stay the course. Thank you very much.

Mr. Carr. Thank you, Mr. Tucker.

[The prepared statement and biography of Frederick Tucker follows:]

TESTIMONY OF FREDERICK T. TUCKER

before the
Subcommittee on Transportation and Related Agencies Appropriations
of the U.S. House of Representatives
Committee on Appropriations
April 15, 1993

Mr. Chairman and members of the Subcommittee:

It is my pleasure to appear before you today. I am Fred Tucker of Long Grove, Illinois, and I am an Executive Vice President of Motorola and General Manager of the company's Automotive and Industrial Electronics Group.

I also serve as the Chairman of the Strategy Review Board for Motorola's Intelligent Vehicle Highway Systems strategic business unit. This business was formed in 1988 to focus Motorola's capabilities on the development and implementation of advanced vehicle/highway technologies, so it was with great interest that I received your invitation. It is an honor to share some of the issues we see as the nation moves forward in its agenda to improve our transportation system.

The potential benefits of IVHS have been discussed at great length in many forums over the past several years. IVHS offers the American public an opportunity to reduce traffic congestion, improve safety, reduce air pollution and fuel consumption, and improve the efficiency of the nation's commerce. In addition to greater public well-being, these factors lead to greater productivity and enhanced competitiveness of our nation as a whole.

As a corporation, our interest in IVHS also is straightforward. Advances in communications, computers and control process technology make the realization of IVHS systems a near-term possibility. That presents my company and others with the opportunity to participate in an emerging market of great significance.

Four years ago, Randolph Doi, Motorola Vice President and Director for our IVHS business, gave testimony before the House Subcommittee on Transportation, Aviation and Materials on the matter of IVHS. Mr. Doi noted that extensive activities in Europe and Japan demonstrate that our confidence in the promise of IVHS is shared on a worldwide basis. In these countries, vehicle manufacturers and electronics companies, with the cooperation of their local governments, have invested heavily in these types of systems since the mid-1980s.

Here in the United States, we came into the game much later than the other players. Mr. Doi cautioned that continued advancements in foreign research, programs and technology presented this country with the challenge to move forward rapidly to avoid the potential loss of yet another technology-based opportunity to foreign competition. He cited several factors that were critical for the U.S. to take a competitive position in the market. The most important factor was clear, national leadership — leadership that could forge the necessary partnership between the public and private sectors to make IVHS a reality.

Much has happened in the past four years that bodes well for the nation's future in IVHS.

> Congress formed IVHS AMERICA as an advisory body to the U.S. Department of Transportation, with responsibility for coordinating IVHS efforts in the U.S. The progress IVHS AMERICA has achieved thus far is significant, and its influence throughout the worldwide IVHS community continues to grow as evidenced by the tremendous attendance at this Third Annual Meeting.
>
> By enacting the Intermodal Surface Transportation Efficiency Act of 1991, Congress provided critical strategic direction for the drive toward a more efficient transportation network. Equally important, the Act provides essential funding for the research needed to define concepts and set standards that will allow the deployment of IVHS in this country.
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> Numerous demonstration projects and field tests are in various stages of development, and the working groups of IVHS AMERICA continue to make progress across a range of pressing issues that will determine the nature of advanced technology solutions.

> We are beginning to identify and understand the system requirements that are necessary to set standards so they will be compatible nationwide.

Clearly, there is great cause for optimism. We have made good progress, and in a remarkably short period of time we have narrowed the gap between the United States and other global efforts.

However, we still have a long way to go, and our greatest challenge as a nation is to maintain our momentum.

The United States has the potential to take a leadership position in the development of advanced transportation technology. But we aren't there yet, and our only chance is if the support continues.

We are at a critical stage. Based on our early progress, we risk becoming complacent just when the major share of the task remains to be done. We need to insure that the ISTEA funding remains available for IVHS so that we can do the research and development to adequately test and define the system.

Although we are behind our international counterparts, we have an advantage — if we only use it. Other regions have outspent us, but their efforts have been fragmented by competing technological approaches and political agendas. In contrast, the United States chose wisely to focus its efforts. Certainly, we also are examining a wide variety of alternatives. However, we share a common purpose and agenda through the direction of IVHS AMERICA and the policies of ISTEA.

Our single greatest challenge is to maintain this course and move forward at an aggressive pace.

I believe the alternative presents unacceptable risks for both the public and private sectors in America. The nation as a whole risks achieving the benefits of IVHS in a timely manner and, over the long term faces the potential of losing yet another key technology and market. The private sector will face a distinct competitive disadvantage in the worldwide market for IVHS if it must compete against better funded adversaries in Europe and Japan. If the U.S. pulls back now, foreign competition will speed ahead.

It's worth noting that before the current economic recession in Japan, one Japanese automaker was shipping up to 12,000 in-vehicle navigation units per month. On a more fundamental level, many of the key components of IVHS — like compact disk players and liquid crystal displays — are essentially controlled by the Japanese. Clearly, there is a lot at stake.

Against this backdrop, I believe that continued funding is a prerequisite for achieving our national IVHS agenda. I believe, too, that there are several other key issues that will determine our ultimate success.

The first is that we need to develop mutual trust between the public and private sectors — a confidence that each of us will step forward and do our part. On one hand, the public sector is understandably reluctant to invest limited public dollars in IVHS infrastructure if the in-vehicle systems aren't there so the public can use it. On the other hand, manufacturers are reluctant to invest and put systems in vehicles if the infrastructure isn't in place to deliver significant benefits for their customers. It's a classic "chicken and egg" scenario. There is no simple solution; we both need to demonstrate significant, ongoing commitment to IVHS so we can come together with shared confidence.

Closely related to this is the need to achieve effective public/private partnerships. IVHS is breaking new ground and testing the flexibility of all participants. Private sector participation currently is discouraged by a cumbersome procurement process and we need to accelerate our learning in this area. Our shared objective should be to streamline the procedures that add value, and eliminate those that simply add time and money to the process. IVHS AMERICA has taken a lead in examining the key areas where resolutions need to occur, and some legislation may be necessary to accomplish this task.

In closing, I believe that the United States is capable of making the promise of IVHS a reality. Certainly, we face significant challenges, and I've outline several of those issues for you today. Yet, the decision to move forward is ours to make.

Already, the U.S. has taken major steps toward achieving our national agenda for IVHS. Through ISTEA and IVHS AMERICA we have a solid framework for commitment and focus, and I believe that viable technology is in place that is capable of meeting the nation's needs. It's more a matter of how much we spend and how fast we push that process.

On Motorola's part, we believe that it is worth the effort. Further, we have backed our belief with millions of dollars of investment and our ongoing commitment to be a full participant in the U.S. IVHS community. It is our intention to be a supplier of in-vehicle systems as well as a provider of communications technology.

We believe that the United States is capable of developing and implementing an effective, nationwide IVHS system. We see the benefits and the opportunity of IVHS and, with your continued leadership, we are optimistic that the United States will stay the course.

Thank you.

MOTOROLA

FREDERICK T. TUCKER

Executive Vice President, Motorola, Inc.
General Manager, Automotive and Industrial Electronics Group

Frederick T. Tucker is an executive vice president of Motorola, Inc., and general manager of its Automotive and Industrial Electronics Group (AIEG). Headquartered in Northbrook, Illinois, AIEG supplies electronic components, modules and integrated electronic systems to original equipment manufacturers. Tucker also serves as chairman of Motorola's Intelligent Vehicle Highway Systems (IVHS) Strategy Review Board.

Joining Motorola in 1965, Tucker has served in a number of senior management positions including corporate vice president and assistant general manager of AIEG and corporate vice president and general manager of Motorola's Bipolar Analog IC Division in Arizona, a manufacturer of semiconductor products. He is a patentee in the field.

Tucker holds a BSEE in Electrical Engineering from Rochester Institute of Technology. He was named to its Alumni Honor Roll of Excellence and is a distinguished alumnus of its College of Engineering. Tucker has served as a trustee since 1986.

Tucker also serves as vice chairman of the board for IVHS AMERICA. Formed as an advisory body to the U.S. Department of Transportation, the board is responsible for assuring the coordination of public and private IVHS initiatives in the United States.

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STATEMENT OF GARY DICKINSON

Mr. CARR. Mr. Dickinson.

Mr. DICKINSON. Thank you, Mr. Chairman.

Good morning. My name is Gary Dickinson, President and CEO of Delco Electronics Corporation, a subsidiary of General Motors. General Motors and Delco Electronics have been active in research on intelligent vehicle highway systems, and I am here representing GM and we appreciate this opportunity to provide our views on the importance of IVHS and our role in IVHS in the U.S.

I would like to congratulate the Federal Government on its leadership role in helping to establish an excellent IVHS program in this country. In fact, in a remarkably short period of time.

Your Subcommittee, and its Senate counterpart, deserve the credit for laying this foundation for a U.S. initiative and it was a 1990 appropriations bill that requested and funded a study on IVHS and this was an important part in the launch of our national IVHS program.

Since that time, we have come a long way toward establishing a full scale IVHS program. IVHS America is evidence of this progress with over 300 members and a very active involvement. A cooperative public-private commitment to IVHS planning, funding research, and demonstration projects will be a success largely because IVHS addresses what people want: Personal mobility that works for them.

IVHS technology represents an "all win" situation for transportation users. Those—both personal users as well as users of public transportation.

And we agree with you and many of the others on this panel that there are many benefits of IVHS technology that have already been mentioned; improved highway traffic safety, improved efficiency of motor vehicle use, and improved environmental quality, enhanced quality of public and private transportation, and of course real progress in reducing traffic congestion.

A number of IVHS technologies such as synchronization of traffic signals can be applied now with funding and a commitment to use them. Advanced IVHS vehicle technologies are seeing some limited application as well. For example, last month Delco Electronics offered a near obstacle detection system for the first time for school buses. It is called Forewarn, and Forewarn uses microwave radar to detect children who might have dashed quickly out of the driver's sight in front of the bus or down the side of the bus and Forewarn immediately sounds an alarm.

For nearly 40 years General Motors has been an active participant and supporter of IVHS technology, our research dates back to the 1950s; wire in the pavement, vehicle guidance systems, and experimental bus systems. More recently, applications of intelligent vehicle technologies included electronic control systems on board, antilock brakes, traction control, even systems to determine the impairment of the driver's performance and near obstacle detection systems. And now our advanced vehicle work has expanded to digital cellular telephones, in-vehicle navigation systems, vision enhancement, adaptive cruise control, lane detection and tracking, and automatic vehicle identification. And we are doing highway systems work as well on electronic toll and traffic management systems.

GM has been very involved in IVHS demonstration projects. The Pathfinder program which was undertaken in June of 1990 was a study of costs and benefits of a motorist information system in a real world setting along the Santa Monica freeway in Los Angeles. Pathfinder was funded by the Federal Highway Administration and the California Department of Transportation. GM was technically involved in all phases of the program; design, operation, and evaluation.

And Mr. Chairman, I know you are very familiar with TravTek, short of course for travel technology, which was the most advanced IVHS field test to be conducted and completed in the U.S. to date. And Mr. Chairman, as you know from seeing that program in action, its objective was to develop tests and evaluate an integrated driver information system and the supporting infrastructure in the entire Orlando metropolitan area.

The TravTek partners, the Federal Highway Administration, American Automobile Association, the Florida Department of Transportation, the city of Orlando, and General Motors, shared the cost of a $12 million project. GM in that project served as the project manager and the systems engineer for the entire project.

Now, we have attached to my written statement materials on TravTek that includes comments from the participants; enthusiastic support for TravTek. The operational phase of that experimental test began in March of 1992 and was completed this past March, and while the complete results are not yet available, those observations that you will see by the drivers of the vehicles is the kind of enthusiasm that we think an IVHS program like TravTek can generate among its users.

Now GM continues to be involved in several more recent IVHS demonstration programs. The DIRECT program in the Detroit metropolitan area, FAST-TRAC which you are hearing about this morning in Oakland County, Michigan, and ADVANCE in the Chicago metropolitan area. Also in October of 1992, GM Hughes Aircraft Company formed the Hughes Traffic management system or HTMS and based on Hughes' expertise in air traffic control, HTMS will employ advanced technology to optimize the performance of the surface transportation infrastructure. HTMS will provide an advanced traffic information system for use on the Borman Expressway and two ATMS programs in Southern California.

General Motors has been deeply involved in the creation and organization of IVHS America. And I currently serve on the board of directors and on their executive committee and we have representatives of General Motors serving on coordinating councils and on the technical committees as well.

In addition, as part of our participation in the IVHS annual meeting taking place this week, GM's Delco Electronics organization and Hughes organizations are both exhibiting advanced IVHS technologies.

Now we placed a brochure at your position at the table this morning on a next generation TravTek vehicle that is on display here at this exhibit and it is called Telepath. We would welcome your stopping by and letting us give you a demonstration of Telepath.

I think this statement this morning demonstrates GM has had a major commitment to IVHS in the past and we will continue that commitment.

The United States has made great progress in IVHS planning and research. I would say though, however, we still have much to do in developing and implementing major IVHS programs. And we are pleased to see that the Clinton administration has signaled its support of national IVHS programs through its 1994 fiscal year budget request and the agencies at DOT have helped put the full scale IVHS effort where it is today.

Government does play an important role in providing leadership, collaboration, and support in areas where the need exists to address significant risks or entry barriers to participation in IVHS programs. We believe that several specific actions will help to enhance IVHS.

Now that the Nation is less reliant on the national laboratories for defense, we support increased joint research in IVHS technologies. The level of cooperation among public private and academic interests and the national labs in a number of areas of IVHS research is already impressive and GM is involved in a number of these. We would encourage additional collaborative roles.

We support continued funding of demonstration projects such as TravTek with real highways and real consumers. Such programs help apply in the near term the IVHS technologies that we already know. And as a member of IVHS America, we support the ideas presented in the IVHS America report entitled Strategic Plan for Intelligent Vehicle Highway Systems in the U.S., dated May 1992. And we encourage the Department of Transportation to continue to use those ideas and recommendations.

In conclusion, Mr. Chairman, General Motors commends the leadership role that this Committee and the Federal Government has played in the great progress of IVHS in the recent years and we believe in the potential benefits of IVHS and we would urge your continued support. Thank you.

[The prepared statement and biography of Gary Dickinson follows:]

STATEMENT OF

GENERAL MOTORS CORPORATION

BEFORE THE

HOUSE TRANSPORTATION APPROPRIATIONS SUBCOMMITTEE

ON

INTELLIGENT VEHICLE HIGHWAY SYSTEMS

Presented By

Gary W. Dickinson

Washington, D.C.

April 15, 1993

I am Gary Dickinson, President and CEO of Delco Electronics Corporation. Delco Electronics is a wholly-owned subsidiary of GM Hughes Electronics Corporation, which is a subsidiary of General Motors Corporation. Delco Electronics is a major contributor to research and system developments in Intelligent Vehicle Highway Systems (IVHS).

GM appreciates the opportunity to provide our views on the importance of IVHS, and to inform the Subcommittee about our role in IVHS activity in the U.S. We commend the Subcommittee for holding this hearing to call attention to this important program.

RECOGNITION OF FEDERAL GOVERNMENT ROLE

We congratulate the federal government for its leadership role in helping to establish an excellent IVHS program in this country -- and in a remarkably short period of time.

Your Subcommittee and its Senate counterpart deserve substantial credit for laying the foundation for a national initiative. As you know, it was a Department of Transportation Appropriations bill that requested and funded a DOT study of IVHS, which was part of the genesis of our national IVHS program.

Recall also that at a conference in May, 1990, a group of IVHS experts representing the public and private sectors agreed to form a coalition to establish a national IVHS program. Today, IVHS America -- the resulting organization -- has over 300 member organizations representing government agencies, the private sector and academia.

In just three years, IVHS America has established an extensive technical committee structure, developed a significant volunteer back-up organization to the committee structure, and opened lines of communication with our overseas IVHS counterparts. In just the past year, this public-private coalition has produced an IVHS Strategic Plan, which was presented to and adopted by the Department of Transportation in June, 1992. In addition, IVHS America established an IVHS Information Clearinghouse to increase the exchange of information and awareness on IVHS technologies and activities. From the start, the DOT designated IVHS America as a federal advisory committee. In a very short period of time, we have come a long way toward establishing a full-scale, U.S. IVHS program.

Finally, Congress should be congratulated for codifying the benefits of IVHS under the Intermodal Surface Transportation Efficiency Act of 1991. We support the premise inherent in the IVHS section of the Act -- that IVHS technologies will contribute to U.S. efficiency and economic viability through improvements in the transportation system.

POTENTIAL BENEFITS OF IVHS

The cooperative public-private commitment to IVHS planning, funding, research, and demonstration projects is a success largely because IVHS addresses what people want -- personal mobility that works.

IVHS is a way to improve the transportation infrastructure, to address issues regarding the use of private motor vehicles, and to permit Americans to continue their preference for personal transportation and the privacy, efficiency and flexibility it provides.

IVHS technologies present an all-win situation for transportation users -- those using personal as well as public transportation. GM supports a balanced transportation system -- a combination of public and private transportation which satisfies social and collective, as well as individual and personal objectives. IVHS technologies provide the opportunity to assure that Americans' travel preferences will be accommodated.

There are near term and long term benefits from IVHS technologies. IVHS activities, if implemented correctly, will help to:

- improve highway traffic safety;
- improve the efficiency of motor vehicle energy use and address environmental quality issues;
- enhance the quality of public and private transportation; and
- address the issue of traffic congestion.

Importantly, with IVHS the future is today as well as tomorrow. Technologies and concepts that are included under the IVHS umbrella -- such as synchronization of traffic signals -- can be applied as soon as there is funding and a commitment to use them.

"High-tech" vehicle features are seeing limited application, as well.

For example, Delco Electronics is now offering a near obstacle detection system for school buses. The "Forewarn" system uses micro-wave radar to detect children who are out of a bus driver's sight in front and on the curb side of a school bus. We are looking at similar applications of radar to detect objects behind a vehicle or in adjacent lanes and to measure closing distances in front of vehicles.

IVHS technologies to manage commercial vehicle operations and fleets are available, too.

Greater transportation efficiencies are possible near and long term. By applying navigation and information technologies, drivers will be able to easily determine recommended routes to destinations, alternative routes around congestion, and basic travel information. Long term, advanced traffic management systems, driver warning and crash avoidance systems, and automated highway systems will provide transportation benefits.

We believe that all society -- rural and urban, commercial, and public and private transportation users -- will benefit from IVHS technologies -- if they are done well.

GM IVHS PARTICIPATION

For nearly four decades, GM has been a major participant and strong supporter of IVHS technologies. Our work on traveler information services dates back to the 1950s and '60s with efforts in highway advisory radio, traveler information services, and traffic management systems. GM Research Laboratories conducted automated highway studies, including wire-in-the-pavement vehicle guidance systems and an experimental bus system. Subsequently, GM was a contractor to the DOT for an automated highway system design and feasibility study, which was reported to the DOT in 1980.

During this and subsequent periods, vehicle-only work in the applications of advanced technology was vigorous and included programs such as electronic control systems, antilock brake systems, traction control systems, determination of driver impairment and performance, and near obstacle detection systems.

More recently, our vehicle work has expanded to include digital cellular telephone, in-vehicle navigation systems, vision enhancement, adaptive cruise control, lane detection and tracking, and automatic vehicle identification. Highway systems work has included electronic toll and traffic management systems. Most recently, we participated in two of the largest IVHS demonstration projects conducted to date.

GM was in the forefront of the Pathfinder program, which was undertaken in June, 1990 to determine the costs and benefits of a motorist information service in a real-world setting. Conducted along the Santa Monica Freeway Corridor in Los Angeles, California, and concluded in the July, 1992, Pathfinder was funded by the Federal Highway Administration and the California Department of Transportation. In addition to providing twenty-five Oldsmobile sedans, which were equipped with navigation and two-way radio communications capability, GM gave technical guidance and participated in all phases of the program -- design, operation, and evaluation.

Results from the Pathfinder program contributed to succeeding IVHS field tests. In addition, as the first major field test, Pathfinder laid the groundwork for successful cooperative relationships for work on IVHS projects among the public and private sectors.

GM also was one of the initiators and a leader in TravTek. Just concluded, TravTek, short for travel technology, is the most advanced IVHS field test to be conducted and completed in the U.S. Its objective was to develop, test, and evaluate an integrated driver information system and supporting infrastructure in an entire metropolitan area. GM served as the project manager and systems engineer for the entire TravTek project. In addition, we designed, built, and installed all of the on-board equipment.

TravTek's partners -- the Federal Highway Administration, American Automobile Association, the Florida Department of Transportation, the City of Orlando and GM -- shared the cost of the $12 million project, which was conducted in a 1,200 square-mile area surrounding Orlando.

Mr. Chairman, as you know from seeing the program in action, TravTek provided motorists with navigation, real-time traffic information, route selection and guidance and motorist information services ("Yellow Pages"). The hardware was installed in 100 1992 Oldsmobiles. Seventy-five of the cars were in an Avis car rental fleet for use by visitors to Orlando and 25 of the cars were used by local residents and for special controlled tests.

The operational phase of the experimental test began in March, 1992 and concluded in March, 1993. A series of field tests, controlled experiments, and evaluations have been defined by the project team and formalized as an evaluation plan. The system is being evaluated on aspects of driver performance and perception, safety, hardware, software, data base accuracy and reliability, and system benefits such as trip time savings and congestion avoidance.

Complete results will not be available until December, 1993. Anecdotal observations indicate that drivers liked the system very much. (Materials from the recent news conference at the conclusion of the field test portion of TravTek are attached, including testimonials from some of the program participants.)

While the Pathfinder and TravTek demonstration programs have concluded, GM is involved in several newer IVHS demonstration programs.

- DIRECT (Driver Information Radio Experimenting with Communication Technology Project), a 36-month operational test in the Detroit metropolitan area that will evaluate four alternative, low-cost methods of communicating advisory information to motorists.
- FAST-TRAC (Forum of Advanced Safety Travel through Traffic Routing and Advanced Control), which combines advanced traveler information services in Oakland County, Michigan.
- ADVANCE (Advanced Driver and Vehicle Advisory Navigation Concept), in the Chicago metropolitan area, which is a TravTek-like follow-on to evaluate the communication and data handling requirement of a larger fleet of vehicles (3,000 to 5,000 vehicles).

In October, 1992, GM's Hughes Aircraft Company formed the Hughes Traffic Management Systems (HTMS), a wholly-owned subsidiary dedicated to supplying systems for the infrastructure portion of IVHS. Based on Hughes history of expertise in air traffic control, HTMS will deploy advanced electronics systems that optimize the performance of the surface transportation infrastructure. They have identified future opportunities to integrate advanced sensor, communication, processing, control and display elements to implement the "smart highway" portion of IVHS.

In addition, HTMS will provide an advanced traffic management system (ATMS) for use on the Borman Expressway in Indiana and they are participating in two ATMS programs in Southern California, with plans for several others across the country.

GM also has been deeply involved in the creation, organization, and operation of IVHS America. I now serve on the Board of Directors and Executive Committee. GM is represented on the Coordinating Council and has made substantial contributions to technical committees. As part of our participation at the IVHS America annual meeting this week, GM's Delco Electronics and Hughes organizations are exhibiting IVHS technologies involving spectrum radio communications, and navigation and communication systems.

I think that I can comfortably state that GM has had the largest IVHS program among the domestic automotive manufacturers, and we continue that leadership.

RECOMMENDATIONS

Obviously, the nation has made great progress on IVHS. However, we still have much to do in researching and implementing major IVHS programs.

We are pleased to see that the Clinton Administration has signalled its support of national IVHS programs through its 1994 fiscal year budget request of $226 million for IVHS programs.

The agencies at the DOT have helped put the full-scale IVHS effort where it is today. The government plays an important role in leadership, collaboration and support in areas where the need exists to address the significant risks or entry barriers for participation in IVHS programs. For example, the Federal Highway Administration's commitment to pursue the large scale automated vehicle highway system study and demonstration project is vital because of the high risks associated with a long term project of this type.

There are several specific actions we believe will help to enhance IVHS development:

- Now that we are at a point that the nation needs less reliance on the National Laboratories for defense, we support increased joint research in IVHS technologies. The levels of cooperation among public, private and academic interests and the National Laboratories in the area of IVHS research is impressive. GM is involved in a number of these programs and encourages other private companies and public agencies to seek collaborative roles.

- We support continued funding of demonstration projects, such as TravTek, with real highways and real consumers. Such programs help apply in the near term the IVHS technologies that we already know.

- As a member of IVHS America, we agree with the ideas presented in the IVHS Strategic Plan, dated May 20, 1992. We encourage the DOT to use its ideas and recommendations.

In conclusion, General Motors commends the leadership role that this Subcommittee and the federal government have played in the great progress of IVHS in recent years. We firmly believe in the potential benefits of IVHS and urge your continued support.

IMPROVING THE FUTURE OF TRAVEL

TRAVTEK DRIVERS LIKE SYSTEM: PUBLIC/PRIVATE PARTNERSHIP A SUCCESS

ORLANDO, Fla., March 23, 1993 -- Throughout its one year test which ends next week, close to 3,000 drivers have rented TravTek vehicles and driven more than a million miles in a 1,200 square-mile area of Central Florida, media were told at a briefing here today.

Preliminary results reveal drivers are very positive in their ratings of TravTek's visual and auditory route guidance system. Drivers perceive the system as helping them save time, drive more safely to their destinations and pay more attention to their driving. In addition, renters also feel the system is easy to use and understand.

TravTek, short for travel technology, is the most advanced Intelligent Vehicle/Highway System (IVHS) field test in the country. It includes navigation and route selection assistance, up-to-date traffic information and services information.

TravTek's partners -- General Motors (GM), the American Automobile Association (AAA), the Federal Highway Administration (FHWA), the Florida Department of Transportation (FDOT) and the City of Orlando -- shared the cost of the $12 million project.

In addition to its technical sophistication, TravTek serves as a model for public/private partnerships and cooperation. According to Norman Van Ness, director of the FHWA Office of Traffic Management and IVHS, "TravTek provided a tremendous opportunity to strengthen the relationship between government and industry and work toward common transportation and mobility goals. The project was successful in all respects."

Dr. Richard A. Moreau, executive director of engineering sciences at GM's Research and Development Center, said, "We'd like to thank the TravTek drivers who participated in the field study and 'test drove the future.' We at General Motors will listen carefully to what you told us about TravTek in hopes of designing a system which will exceed the needs of our customers when we offer a TravTek-like system in GM vehicles."

"AAA's participation in TravTek was very beneficial since it confirmed expectations that both business and leisure travelers are highly interested in getting up-to-date detailed information on hotels, restaurants and attractions while they are traveling," said

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Kent Taylor, director of Advanced Traveler Information Products for AAA. "AAA will continue to explore new ways to deliver travel information electronically."

"We're very pleased to have been part of an important transportation management prototype," Orlando Mayor Glenda E. Hood said. "We will continue to use leading-edge technology to provide our residents and visitors with the most efficient and safest roads system possible."

George Gilhooley, Traffic Operations Engineer for District Five in Orlando, said, "The program was great. We learned a lot about the technology and that public agencies and private concerns can work together to develop successful programs like TravTek."

Detailed evaluation results of the TravTek project will be released throughout the next 12 months as analysis is completed.

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IMPROVING THE FUTURE OF TRAVEL

News

11 STUDIES COMPRISE TRAVTEK EVALUATION PROGRAM

ORLANDO, Fla., March 23, 1993 -- In addition to being the most comprehensive test of an Intelligent Vehicle Highway System (IVHS) in the U.S., the TravTek project will provide the most extensive IVHS field program research results to date, a Federal Highway Administration (FHWA) official said here today.

"TravTek's evaluation data will provide an unprecedented human performance data base for understanding the benefits driver information systems offer in reducing traffic congestion and learning how people interact with these systems," Norman Van Ness, director of the FHWA Office of Traffic Management and IVHS, said.

Throughout the field test, which began in March 1992, 11 separate but integrated studies assessed aspects of driver performance and perception; safety; hardware, software and data base accuracy and reliability; and system benefits such as trip time savings and congestion avoidance.

Van Ness said, while the data collection process ends on March 31, 1993, complete results will not be available until December 1993. "What now remains is to complete the data analysis and to accomplish a series of system evaluations." Preliminary results, however, reveal driver satisfaction with the system.

According to Dr. James H. Rillings of General Motors and project manager for TravTek, the evaluation program should not be underestimated. "Without the detail of the evaluation all we'd know is whether or not people liked the system," Rillings said. "That's great but it's the evaluation program that will provide answers to questions like, 'How much time did people save? Which features did they use most? How did their driving change? And what could have been done better or differently?'"

As part of the TravTek partnership, the Federal Highway Administration paid for the evaluation and contracted Science Applications International Corp., to conduct the studies.

Brief descriptions of the 11 studies are listed below:

- **Rental Users -- Field Study**
  Studies the benefits of the TravTek system and how it is used by people unfamiliar with the area who are free to make choices.

- **Local Users -- Field Study**
  Studies the benefits of the TravTek system and how it is used by Orlando drivers who drive an average of 60 miles per day, to varied locations, over an eight-week period.

- more -

TRAVTEK

- **Yoked Driving**
  Controlled experiments to test the effects of TravTek route guidance and traffic information on time savings and network efficiency.

- **Orlando Test Network**
  Tests for differences among several TravTek electronic display formats as compared to paper map navigation.

- **Camera Car**
  A specially-instrumented one-of-a-kind TravTek car focuses on driver performance concerns in order to learn, in detail, how drivers interact with the system and how this use changes with experience.

- **Questionnaire**
  Focuses on rental and local drivers' perceptions of TravTek's features and benefits.

- **Debriefing**
  One-on-one interviews to assess drivers' first impressions.

- **Traffic Modeling**
  Computer simulation study to predict the benefits of having various proportions of TravTek-equipped vehicles on the road.

- **Safety**
  Assesses TravTek's contribution to safer driving.

- **Architecture evaluation**
  Focuses on the infrastructure components of TravTek and especially assesses the benefits of the Traffic Management Center in providing real-time traffic information to the vehicles.

- **Global Evaluation**
  Macro evaluation of how well TravTek met its stated objectives through an examination of all the results. In addition, it will review the success of the public/private partnership.

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IMPROVING THE FUTURE OF TRAVEL

WHERE AM I? TRAVTEK VOICE TELLS DRIVERS

ORLANDO, Fla., March 23, 1993 -- The voice has perhaps been the most talked about feature of the TravTek system since its introduction last March. Although talking cars may be controversial, evaluations show nearly all drivers strongly agreed the TravTek voice guidance feature was useful.

"In the past, talking cars have not been well received for several reasons. Sometimes the voice was seen as a gimmick, it wasn't always the most appropriate way to provide information, drivers had no control over the voice and it only spoke to tell drivers they had done something wrong. No one wants a car that nags," said Dr. Linda G. Means, from the General Motors Research and Development Center.

"GM's top priority in designing the TravTek voice system was to achieve user acceptance. We wanted drivers to welcome the voice feature and find it helpful. Based on the data we've examined so far, it appears we've succeeded," Means said.

TravTek drivers had the freedom to turn the voice features on and off, however, voice guidance was left on most of the time. In addition, the route map and guidance displays were rated significantly higher with voice than without the accompanying auditory guidance.

TravTek's spoken messages include: route guidance, navigation assistance and traffic information. The computer's speech is generated by a voice synthesizer, which offers the benefit of a large variety of messages.

Although TravTek drivers reacted positively to the voice with respect to clarity and understandability, future advancements in speech technology should further improve voice intelligibility.

The voice functions as a supplement to the visual route guidance displays, which can be used as an independent system.

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TRAVTEK

IMPROVING THE FUTURE OF TRAVEL

ORLANDO DRIVERS EXTOL TRAVTEK'S BENEFITS

ORLANDO, Fla., March 23, 1993 -- Four of the 50 Orlando-area drivers who participated in the TravTek field study, which began last March, praised the TravTek vehicles and project here today at a media briefing.

To qualify for the study, drivers had to drive an average of 60 miles per day to varied locations. Each participant had the vehicle for eight weeks.

Following are comments from each:

REVEREND JACK DAY, 64, volunteer police chaplain, City of Orlando

"Each of us in the department has a book of maps but when you're in a hurry it takes a little time to find your place. I attempted on several of the calls to have the car direct me to my destination and it would take me directly there like an eagle to its nest. It saved me 15 to 20 minutes per trip which for me is essential. It was a terrific help for my work. I was spoiled by it."

"I was running late for a backyard wedding because of another appointment and I realized I had lost my directions to the house. I punched in the address which was about 25 miles away. I was a little nervous about getting there on time but the car got me there 15 minutes early."

"When I'd drive to a mall I'd get 15 to 20 people who would gather around. I'd show them the car and they were mesmerized."

"It made me more alert -- I didn't keep my eyes on the computer -- I listened to the voice."

"I had a few difficulties with the system but I'd stop and call the help desk and I was on my way in no time."

BETTY W. BARNES, 71, payment coordinator, Orange County Tax Collector

"What's so fantastic about the car is it helps you, especially at night when you can't read the signs -- I just listened to the voice."

"The car especially would be good for someone who's new in town, there's no way you can get lost. Strangers are always walking up to me asking what's on the back of the car [global positioning satellite receiver]. The car blows everybody's mind that sees it."

"I've loved every minute. Even though you're familiar with the area it's still a help. I'd buy one."

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RICK BROWN, 41, residential security systems salesman

"I've sold residential security systems for three years. I drive 30,000 miles per year and have lived in Orlando for 13 years. I figured I knew every short cut there was. TravTek gave me routes that I would have said no way to, but I took them and it saved me time. Even now that I don't have the TravTek car, I still use those time-saving routes."

"It's difficult to read maps in the car at night but I didn't have to worry about that with TravTek. Plus, you don't have to slow down when you're anticipating a turn and become a hazard to those behind you. TravTek tells you where to go and when to turn."

"The people at the AAA help desk were incredibly efficient, polite and helpful -- an asset to the TravTek program."

"I left my map book home for the two months I had TravTek."

"I fell in love with the system -- it's an invaluable time management tool. I already miss it."

SUSAN CRAMER, 37, real estate agent

"When I went to pick up my TravTek car last summer my husband dropped me off. I'm not used to the east side of town and I didn't pay attention to how we got there. When I was ready to go home, I realized I not only didn't know where I was, I didn't have any money for the tolls. After a few false starts the car got me home. It's the most wonderful feeling. I felt like one of the astronauts in space, you don't know where you are but you're listening to this voice guide you and you trust it to get you there -- and without tolls!"

"In my business, you're not only looking at the directions but you're talking to your customers and watching for traffic. With TravTek, I could listen to my clients and the car would alert me when I needed to turn."

"I liked to use the map when I was in a subdivision showing five or six homes. It showed me exactly where to turn and where I was without having to enter the exact address. It was very detailed."

"The map is great even when you're out of the 1,200-mile area. My son and I drove to Cocoa Beach and even though we weren't being routed anymore, I knew where we were headed since the map still showed the major highways. I didn't need to use the atlas we brought with us."

"In my business it's so wonderful to pick up your keys and go without running around looking for a map. It gives you freedom. I can't wait until TravTek is available, it's unbelievable."

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GARY W. DICKINSON

Gary W. Dickinson was appointed president and chief executive officer of Delco Electronics Corporation effective Jan. 1, 1993. Mr. Dickinson had been GM vice president and group executive in charge of GM's Technical Staffs from June 1988 to October 1992. He briefly assumed responsibility for the Industry-Government Relations and Environmental Activities staffs from October 1992 to his present appointment.

A native of Montclair, N.J., Mr. Dickinson was born May 12, 1938. He graduated from Duke University, Durham, N.C., in 1960 with a bachelor of science degree in mechanical engineering.

Mr. Dickinson joined General Motors following his graduation to begin development of early automotive emissions control systems at the GM Proving Ground in Milford, Mich. He later established GM's emissions laboratory in El Segundo, Calif., to meet state regulations and prepare the company for federal standards.

In 1970, Mr. Dickinson returned to GM's Technical Center in Warren, Mich., as staff engineer and a founding member of the GM Environmental Activities Staff (EAS). The following year, he moved to Washington, D.C., to establish a technical liaison office for GM, working with federal agencies on emission control activities. He returned to Michigan as assistant director of automotive emission control for EAS in 1975.

Mr. Dickinson became GM's first congressional assistant with the National Industrial Conference Board in 1976, working with Senator Robert Dole (R-Kan.) as a staff member on the Senate Budget Committee.

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Following this assignment, Mr. Dickinson became manager of advanced design for Buick Motor Division in Flint, Mich. He was promoted assistant chief engineer for Buick in 1980 and then director of engineering for AC Spark Plug Division (now AC Rochester), in 1982.

In 1984, Mr. Dickinson was appointed program manager for development of the new mid-size Buick Regal, Pontiac Grand Prix, Chevrolet Lumina and Oldsmobile Cutlass Supreme models. He was elected a GM vice president and was promoted to group director of engineering for the Chevrolet-Pontiac-GM of Canada (C-P-C) Group in August 1985.

As group executive of the GM Technical Staffs, Mr. Dickinson managed the GM Research Laboratories, Design Staff and Advanced Engineering Staff, including all GM Proving Ground.

Mr. Dickinson is one of the founders and governing council members of the United States Council for Automotive Research (USCAR), an umbrella consortium for pre-competitive research by GM, Ford and Chrysler.

He is also a member of the Board of Directors of Group Lotus plc and the Intelligent Vehicle Highway Society of America (IVHS America). A member of the Dean's Council of Duke University's School of Engineering, the Advisory Council for the National Society of Professional Engineers, and co-chairman of the Society of Automotive Engineers Emerging Technology Advisory Board.

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NEED TO DEVELOP CREDIBLE EVALUATIONS

Mr. CARR. Thank you very much, Mr. Dickinson. We appreciate all of you being here and it is very helpful to hear your ideas and to get your advice or the direction of the program.

I have a couple of questions. Dr. Horan, I want to come back to you. I think you made a very good point that we need to evaluate what we are doing at every step of the way. Personally, I think of myself as a person who is really interested in technology and I find, however, sometimes that I catch myself into having to assess what it is I am doing as a user of technology.

It is very easy to end up with an advanced computer on your desk and not put it to its best use, you get diverted and distracted into video games and other interesting little things that sort of delight the eyes but don't really enhance your productivity. I have caught myself a number of times doing that. I think society as a whole can get somewhat distracted.

I think of points in history we haven't done things because we needed to get them done. We wanted to do things at great public expense because they could be done and they were interesting to do, but probably didn't make an overall contribution to our economy.

I think in particular, and I am a big fan of aviation being a pilot myself, many years ago the country was told that the Soviet Union and the Europeans would have supersonic transports and that we would suffer great loss of face if we didn't have an SST of our own and that it was some kind of a badge of dishonor that America's can-do spirit decided that it didn't want to do it. History will probably record that, at that time, that was a very good decision and I think it launched a number of people into the discussion of the appropriateness of technology.

I welcome the kind of tough-mindedness of your statement and hope that you would continue to give us some advice as a committee on how we would better use the taxpayers' dollars, not that dazzling things aren't interesting, but as Mr. Tucker pointed out, we have scarce dollars. The public is demanding a great deal of accountability from us and so your words about developing an evaluation is a real solid assessment. Not that some of these other things shouldn't be done or even attempted and tried but maybe those are the things that should be more appropriately put totally in the private sector. If keeping our focus on the core, using Federal dollars, of what we are trying to achieve then I think it would be a very important thing to do. So your advice will be taken.

CONSISTENT FUNDING

Mr. CARR. Mr. Rowe, I like what you had to say about steady and consistent funding. We face a particular problem this year. The President has proposed that we spend $3 billion more than we are likely to have available and it falls to this committee to make some key decisions. As we look toward the future, we want to be able to assure the transportation community at large that there will be steady funding, although sometimes not at their desired levels because we don't want to inject oscillations into the funding stream.

We want people to know that we will provide, to our best effort, as much funding as they had last year.

I don't want to come to a hearing at the fourth annual IVHS meeting or the sixth annual IVHS meeting and have to try to explain why we couldn't find as many dollars this year as we did last year. I want to make sure that we are always at effort or a little bit above it.

I think you do open up an interesting dilemma between the capital side and the operating side which the Committee has to be attendant to.

Dr. Braun, it is always nice to get a report on how other money is being spent. You are represented by our good friend on the Committee Marty Sabo, who wanted to be here today. He is also the Chairman of the Budget Committee and right now it is a heavy budget time so he was unable to be here so he thanks you. Of course from home, General Motors way, Mr. Dickinson and again Mr. Tucker, we appreciate you both being here.

Mr. Wolf, do you have any questions?

IVHS AS PART OF HIGHWAY DEMONSTRATION PROJECT

Mr. **Wolf**. Yes, Mr. Chairman, I do. I have a number and I too will make them fast, and perhaps whoever wants to, can answer my questions.

First, Mr. Rowe, should we give extra points to highway demonstration projects that we fund which are going to have an IVHS aspect? We are trying to come up with standards that the committee, the Congress, and the administration could use when funding highway projects.

Mr. **Rowe**. Well, I would certainly say so from my viewpoint, the IVHS type programs give us more bang for our buck and the way we looked at it in the Los Angeles area is that we should be emphasizing and giving priority to those projects like IVHS that allow us to operate our highway network more efficiently.

Mr. **Wolf**. As we are looking at demo projects, you think that should be a factor?

Mr. **Rowe**. Well, I think——

Mr. **Wolf**. A lot of people come before the Committee with demonstration projects and the question is this one: should an IVHS component be a factor?

Mr. **Rowe**. Whether it is an IVHS type of demonstration.

Mr. **Wolf**. Any project that could be IVHS-involved, should we make sure that it is involved?

Mr. **Rowe**. Well, I think we would have to look at the context of the project. Certainly if there was potential for IVHS, that would be a reasonable question, I think, to inquire about because we do have—we are in the process of developing some very specific national IVHS goals on deployment in this country and I think it is essential that we do make progress in attaining that vision and certainly there is a limited amount of funds and, with a limited amount of funds, I think we should be asking those types of questions.

USER-FRIENDLY SYSTEMS

Mr. **Wolf**. How do we make these projects user-friendly? I don't operate a computer. All five of my kids do. I might get one of these in my car and it sounds nice, but I know the way to work and I may go that same way. How do we deal with that issue?

Mr. **Tucker**. Let me comment on that. I think the pilot programs are very important for those exact reasons. A lot of what we have been doing has been with very small unit volumes. For example, in the Chicago area in 1994 we plan on having 5,000 vehicles actively giving all of us feedback in terms of the practicality.

I made a note of Mr. Carr's comment in terms of practicality. We do not want this to become the remote control for your television where you have to have an advanced degree to use it or a VCR that frankly I have to pull out the manual every time, and then I am not sure I know how to operate it.

And what we are focusing on is user-friendly. You have to almost think of this in terms of your mother or father being able to go and use this easily and I think we will learn this from these programs so that meets the support. We are going to make some mistakes, probably, but we need that feedback in terms of the cycles of learning.

FOREIGN TECHNOLOGY

Mr. **Wolf**. How far are we behind the Japanese and the Europeans?

Mr. **Tucker**. I will take that if you would like unless, Gary, you would like to.

Mr. **Dickinson**. Go ahead.

Mr. **Tucker**. I think a few years ago we were significantly behind. I think the Japanese had identified this as a need in terms of their congestion within Japan itself and I think they also identified it as a global market opportunity.

Over the last three years, I think that gap has been narrowed significantly, but we shouldn't get too comfortable because, as we all know, a lot of our markets have, and particularly in the high technology, have gone that way. But I would say the gap is minimal at this point. Perhaps some of my associates would also like to comment on it.

Mr. **Dickinson**. Mr. Wolf, if I might comment just briefly, I would say that it depends on the kind of technology that your question refers to.

And just to give you a couple of examples, I don't think the U.S. industry lags behind the Japanese or the Europeans in the application of some forms of technology to the vehicle today. ABS brakes is an example. Traction control, head-up displays.

I would say that in the application of navigation systems, the Japanese have already implemented some navigation systems in production and so I would say they are slightly in the lead in that because of their interest in navigation. And as Fred pointed out, particularly in the Tokyo area and the difficulties in navigating through Tokyo. But I don't think the technology is any farther behind. I think the application is further behind.

Mr. **Wolf**. Concerning the automotive people you are working with, are you committing to having this in General Motors' cars as fast as in Toyotas?

Mr. **Dickinson**. It depends on the market demand. One of the reasons we were very active and continue to be active in demonstration projects is to develop those technologies and get a reaction from the public about the marketability of the technologies.

TRAVTEC DEMONSTRATION

Mr. **Wolf**. What were the reactions to TravTec in Orlando? I saw reports of problems. There was a report in the Washington paper, indicating the system confused the users and didn't work well. On the other hand, I have read other good reports about this system.

Mr. **Dickinson**. This was your insightful question earlier: What is the technology going to be like as a real user? And we learned a great deal from that study.

Now, Mr. Carr and myself have both been down there and experienced those vehicles and there are things about that TravTek vehicle and the technologies involved that are complicated and maybe not so easy to adapt to initially. There are things about it that are very simple.

For example, there was a voice system in the vehicle that directed you at your next corner as to which way to turn. I found that personally very helpful. Following the map on the screen on a regular basis was difficult.

So those are things that we are learning from the TravTek experience and those data are not all completely analyzed but we should have by the end of year a very good analysis.

FOREIGN TECHNOLOGY INVESTMENT

Mr. **Wolf**. Let me ask you a last question and then I want to make a statement. Mr. Tucker, you have raised level funding. Federal dollars are limited. We have a deficit. Even with the Clinton administration's so-called deficit reduction package, in 1997, the deficit begins to go back up.

What is the level of IVHS funding percentage-wise in Japan and Europe compared to what the Federal government level is here? Are we doing as well as they do? Is most of their money coming from the Japanese government or coming from Japanese companies? Where are we in relationship to the Japanese and Europeans in Federal governmental taxpayers' support? Are we even, ahead, behind? And if you can for the record, show how many dollars the Japanese have committed of their taxpayer money to IVHS.

Mr. **Tucker**. I don't have those exact numbers available to me right at this moment. I think with the increase from just a couple of years ago of $4 million funding and then the funding going up now to where we are approaching $200 million and are eventually going to get up above that, I think that gap is being closed very, very rapidly.

Mr. **Wolf**. Could each of you find out?

Mr. **Tucker**. I am going to let Mr. Braun answer that.

Mr. **Wolf**. I would like to see what the Japanese government has put in during the last five years, and what our government has put in the last five years.

Mr. **Braun**. Mr. Chairman, Mr. Wolf, that really is a very important issue. Initially the overall program in Europe was much larger than the United States and the same way in Japan. I think it would be best if we had IVHS America provide you with the actual numbers rather than someone doing it from memory here.

I want to elaborate on just one other point and that is what Gary Dickinson said about whether or not technology is ahead or behind in the United States versus the rest of the world. I think that depends upon the type of technology.

In the case of the image sensing systems which we are using here in Oakland County, Michigan, obviously in our opinion we are far ahead of anything else that is going. With the case of navigation aids, Japan is ahead. I also want to comment on the voice issue. That is a key thing as far as I am concerned, that you can transmit that information, make it easier for the public to understand by doing it both visually and audibly and the Voice System who was criticized in Orlando is going to sell very well in Minnesota.

USE OF AVI TECHNOLOGIES ON TOLL ROADS

Mr. **Wolf**. There is one other thing. I am in support of the program and I don't mean this to be critical of my own VDOT here, there is a good representative here from VDOT. But we have automated signs on I-66, and they are almost never right. I will come up to the sign and it indicates congestion and I don't know whether to get off or not, and a couple of times I have gotten off. Other times I have decided to plow ahead, almost every time there is not really a backup. The signs are not really believable. They are not reliable, not dependable. If a driver consistently finds out that the signs says accurately predict a backup, they begin to believe it. But if they find out that it says a "Backup Five Miles", and they sail straight through to Vienna, there is a credibility problem.

Secondly, I am begging the State of Virginia to put the AVI system on the toll roads. Now, Dr. Horan, you are from George Mason. You should be talking to VDOT. They have been planning to do this for years, and we are still have old toll booth equipment machines. You throw the coins in, and sometimes the gate goes up, and sometimes it doesn't.

The point is what we say ought to be matched with what we really do. If we make claims that do bear out, then I think we are going to lose public support. And I am looking at my own toll road. The collection system doesn't work. And secondly the automated signs—and I saw some people nodding their heads yes who must live in this area—on I-66, are not now really believable. I don't know if you have any comment, but I think we have to make sure that our performance matches our words.

Mr. **Horan**. Living in the area as well as working at George Mason, I am of course compelled to comment.

First of all, and this gets back to the Chairman's comment in the beginning, developing credibility in a program is essential. And it is one thing to have potential technologies and it is another thing to have those on the street in a way that are used.

And I think that the program will benefit to the extent that we can take a user orientation, that is our early benefits for users out there that develops credibility. And while much of the program to date has had an in-vehicle orientation, there is of course a constellation of possibilities and the AVI technologies are one that are really racing ahead for good reason.

The reduction of toll congestion is something that can be realized right away and it is those kinds of early benefits that can really aid the program as viewed from the public.

Mr. WOLF. Are there many toll systems that are using it today?

Mr. HORAN. There are several up and down both seaboards. In New Jersey they have started something. In California, Oklahoma, and others. So it is close to off-the-shelf kind of development.

Mr. WOLF. Thank you very much. I appreciate all of you taking the time to come here. Thank you, Mr. Chairman.

Mr. CARR. Mr. Price.

APPROPRIATE FEDERAL FUNDING COMPONENTS

Mr. PRICE. Thank you, Mr. Chairman. I would like to add my thanks to this very fine panel and also to IVHS America for cooperating with us in making this hearing possible. I think we have in this setting with the adjacent displays, the kind of hearing it would be very difficult to have on Capitol Hill and I know a lot of effort has gone into it and I am grateful for that.

Let me begin just by underscoring the importance of Mr. Wolf's question about international comparisons. International comparisons, of course, of progress we and our competitors have made in developing and deploying these systems but also comparisons about how all this is financed. And particularly on the governmental role, the governmental investment that we are seeing in our competitors vis-a-vis our own effort.

So I hope we can have some good definitive numbers from IVHS America that will help us assess the financing of these efforts in this country compared to other countries, and in particular the role assumed by the Federal Government.

Mr. Rowe, I would like to move to that aspect of your testimony which stresses the importance of operation and maintenance support. You stressed that it will be critical to the success of IVHS that the system be operated and maintained properly and you suggest, if I understand you correctly, that we may need to consider more Federal funding for operating and maintenance expenses in these systems.

As you know, you are walking into a considerable debate here about what the Federal role should be in funding transportation initiatives in general. Many argue that the Federal role mainly should be restricted to helping provide capital, so how large a role should the Federal Government play in this area?

To make the question somewhat more pointed, why should we consider funding the operating expenses of IVHS when we are cutting back in our support of operating expenses for transportation at this time and other transit alternatives?

Then there is the question of State and local governmental share, to what extent should the Federal Government pick up the slack here if the State and local governments aren't really participating sufficiently?

Mr. ROWE. Well, Congressman Price, this is a very complex question. As I indicated in my testimony, that Congress did take in my view a very important step forward in the ISTEA legislation by allowing for operational test money in the surface transportation program. Those monies can be allocated on an indefinite basis on start-up cost under the National Highway System Program and operational test money with certain restrictions on the CMAQ program.

So a very important step was taken in the direction that I was recommending in the ISTEA legislation. I was merely recommending that we now take the next step and include maintenance type of allocation of funding availability to local and State agencies.

Now, let me point out that the City of Los Angeles although 100 percent money was available for implementation of an ATMS type of system, we used that originally to get our program under way. It was very attractive to the local decision-makers that 100 percent money was available. But then as we proceeded with the program and as it was deemed to be successful and there was local recognition of that fact, there was a willingness to try to accelerate the program and put the local money into it.

So that we are at the point now that in our $250 million budget we are looking at approximately 55 percent Federal funding, 45 percent local funding in that program.

I would suggest and with regard to maintenance funding that we approach it from somewhat the same viewpoint, that Federal money can play a very important role in leveraging local decisions, that once that money becomes available, that local decisions I think are more apt to be in the direction of providing maintenance money and I think it can be structured in a way so that the Federal money is not exclusively used for all the 100 percent maintenance but is used to leverage those local decisions which are essential.

Because there is no point in moving on or implementing these systems at a local level if they are not going to be maintained adequately because I think it is going to be an embarrassment to everybody involved and that money could be more effectively used elsewhere.

Mr. PRICE. Well, in your reading, there would be some revisions in ISTEA required to make that possible?

Mr. ROWE. In terms of flexibility, I wasn't necessarily suggesting that given a limited Federal funding that you needed to increase the level of funding. Obviously what would happen if some ISTEA funding was used for maintenance, say on a matching basis, that would somewhat slow up the deployment, the capital side of the program but I would suggest that it is better to have a program that is progressing slower in terms of implementation and have it properly maintained so it is operated in a way that the public sees that they are getting the benefits from the investment and to speed ahead on the deployment without that other very important element maintenance being properly covered.

Mr. PRICE. Are there other members of the panel who would like to comment on this issue, the appropriate use of the Federal component of the funding and the balance between the financing of deployment, initial establishment of the systems and their continuing maintenance?

Mr. Horan.

Mr. HORAN. I would, Mr. Price, yes. The piece of information I would add is that ISTEA, which has frequently been referred to here, really reinforced the power of regions in making their own decisions about how to spend funds. It strengthened the partnership between the MPOs and transportation departments. So as it plays out, I think that those regions should be put in a position of making some of the trade-off decisions themselves in terms of what types of systems they want to have there for their region and the role that IVHS would play.

So although Federal funds would invariably would be involved, I thought I would add that as a critical element to what is the decision-making path that follows public funds.

NATIONAL WORKSHOP ON IVHS AND AIR QUALITY

Mr. PRICE. Any other witnesses have anything to add on the maintenance question specifically?

All right. Let's turn, Dr. Horan, to your testimony. I was particularly interested in your comments on the national program, particularly your comments suggesting the operational tests that hadn't been sufficiently attentive to the air quality impacts of IVHS.

I wonder if you could elaborate for us the recommendations that were made at your national workshop for strengthening IVHS tests and research in this environmental area.

Mr. HORAN. I would be glad to. First of all, the operational tests have in part looked at air quality, that is it is often considered one of several measures that they attend to when they conduct their evaluation.

What many of the participants in the workshop found was that this often was not the primary objective of the operational test. It was to do other things and this would be one of the issues it would look at. So the conclusion was to start to orientate the program to at least in part have a more high priority on air quality.

What this would mean in specifics is, for example, to have an operational field test that aimed to maximize the air quality impacts of IVHS, rather than to, let's say, assess, you know the air quality impacts as one of many things. This hasn't really been done in this country but it has been done overseas. Apparently there are some programs that are actually geared towards the small region and kicks in with certain types of activities.

To focus a field test on that would add to the portfolio of research, as well. There is some thought that some cross cutting review could be done of ongoing operational field tests to see the kind of results that they are getting on this dimension. So those were at least two of the recommendations that are coming out of the workshop.

Mr. **Price**. Well, certainly these claims for environmental benefits are often made, often made in rather general terms, so it would seem to be an appropriate focus for future research. I also think it has some political value if I may say so. We need a broad coalition, I think, in supporting this technology, in supporting these efforts and I am not sure that the environmental and the safety advocates are as prominent as they might be in the leadership positions.

At IVHS America, for example, at least in my looking over the materials, it is not clear that people with this particular interest loom very large in the leadership.

I wonder what the reaction of these groups has been. You are saying they have a stake in it, should have a stake in it. What has the reaction of these groups been to these technological developments? Do you think there has been enough outreach to make certain that people with environmental concerns, safety concerns, understand the potential benefits of investing in this technology, understand what they have, what we all have really at stake in this national effort?

Mr. **Horan**. Well, it is an excellent question. We invited several representatives of various environmental groups to this workshop in southern California and of course that led to a very spirited discussion about IVHS. And I think there is fairly widespread acknowledgment that to date the outreach is not complete.

IVHS America has been taking steps. There are other representatives that can speak to it. They established a committee just yesterday on energy and air quality. There were cosponsors of this workshop that had several representatives in the environmental community. I think much more needs to be done in that area.

There has been a kind of an institutional buffer between the development of IVHS and the input from a number of areas and the environment is one. Given the Clean Air Act exists, there is every reason in the world to start to get those voices in and to start to hear what those prospects are.

IVHS OUTREACH PROGRAM

Mr. **Price**. One thing is certain in this budget climate, in this political climate, no one can take for granted that the virtues of their work and the public benefits of their work are self-evident. We all must be attentive to that job of interpretation and education.

Mr. Braun?

Mr. **Braun**. Mr. Chairman, Mr. Price, I really appreciate the remarks you just made because I think they are right on the mark. I don't believe that anyone in the IVHS business today can say that our outreach program has been sufficient because it hasn't been. Too many people don't even know what the four initials mean and we have a long way to go to get them to understand the benefits.

I chair the coordinating council of IVHS America. We met yesterday morning. We had a presentation on the proposed outreach program that IVHS America will be implementing and it covers facets all the way from preschoolers up to retraining people who are currently in the transportation industry because that is a serious shortcoming. You have our activities today and I also would like to add that IVHS America would like to elaborate on the various responses to your questions that you made today and do that in writing and give you a better answer than we have in some cases here.

Mr. PRICE. Thank you. That would be very helpful. I thank all of you. Thank you, Mr. Chairman.

Mr. CARR. Thank you. And once again, I want to thank the witnesses for their time and attention to the education of this Committee and look forward to working with you in the future. Thank you very much.

SECOND PANEL OF WITNESSES

DON C. KELLY, SECRETARY OF TRANSPORTATION, COMMONWEALTH OF KENTUCKY; CHAIRMAN, ADVANCED RURAL TRANSPORTATION SYSTEMS COMMITTEE (IVHS AMERICA); AND CHAIRMAN, SPECIAL COMMITTEE ON TRANSPORTATION SYSTEM OPERATIONS (AASHTO)

HAL KASSOFF, ADMINISTRATOR, MARYLAND STATE HIGHWAY ADMINISTRATION AND CHAIRMAN, I-95 CORRIDOR COALITION

JOHN GRUBBA, DEPUTY COUNTY EXECUTIVE, PONTIAC, MICHIGAN

BRENT BAIR, MANAGING DIRECTOR, OAKLAND COUNTY, MICHIGAN ROAD COMMISSION

GENE BERGOFFEN, EXECUTIVE VICE PRESIDENT, NATIONAL PRIVATE TRUCK COUNCIL

INTRODUCTION OF SECOND PANEL

Mr. CARR. On our next panel is Mr. Don Kelly, Secretary of Transportation with the Commonwealth of Kentucky; Mr. Hal Kassoff, Administrator of the Maryland State Highway Administration; Mr. John Grubba, Deputy County Executive, Oakland County, Michigan, accompanied by Mr. Brent Bair, Managing Director of the Oakland County Road Commission; and Mr. Gene Bergoffen, Executive Vice President of the National Private Truck Council.

Welcome and thank you again.

As a reminder, we must vacate this room in approximately one hour and 20 minutes. If you would summarize your statements, that would be most helpful. Your printed statements will be made part of the record.

STATEMENT OF DON KELLY

Mr. CARR. With that, first on my list is Mr. Kelly. We are pleased to have you with us this morning.

Mr. KELLY. Thank you, Mr. Chairman and Members of the Committee. It is a pleasure to be with you. My name is Don Kelly and I am Secretary of Transportation in Kentucky but I also serve as Chairman of the Advanced Rural Transportation Systems Committee of IVHS America, and Chairman of the Special Committee on Transportation System Operations of AASHTO.

I appreciate the opportunity to address you on this important topic of the need for Intelligent Vehicle Highway Systems in the rural environment. My State represents a window in the United States in that our population is approximately half rural and half urban. About 40 percent of the total travel is in rural areas and our population is near the median of the United States.

However, my perspective may be slightly different from some of the other speakers as I come from an environment where I answer to a governor, the legislature, the media, and about 3.6 million citizens, all of whom are not noted for having pretty much patience.

Last year in a very tough budget year we were able to get a commitment from our legislature, a significant commitment to IVHS projects in the Commonwealth of Kentucky and this was a significant achievement to us but it also puts us under the burden of producing positive results in a short period of time.

We must deploy projects that meet the needs of the citizens of the Commonwealth of Kentucky and also travelers through the State of Kentucky and in doing so, IVHS offers many, many opportunities for us. In the past, Intelligent Vehicle Highway Systems almost by definition have been defined as urban projects and there are great needs in the rural areas and we are working very diligently to identify many of those needs and to try to identify projects that can offer early success.

We keep using the word deployment but that is key to it: The projects that we can get out on the ground and show that there is positive effort and positive proof that things can be accomplished.

Safety is the major issue in everything that we deal with in looking at the IVHS projects in the rural environment. Only about 40 percent of the travel occurs in the rural areas in the United States yet about 60 percent of the fatalities and accidents occur in rural areas.

As a simple point of information, probably the simplest and most common form of the intelligent vehicle today is the cruise control which is contained on virtually all vehicles today. This device when used properly is an important factor in reducing traveling fatigue. In the wee hours of the night, this device might be the most dangerous on the vehicle. It is often tempting to get too relaxed and doze off at high speeds and rural terrain is not very forgiving to an accident.

Rural facilities, whether they are multi-lane, high speed, access-controlled highways, or narrow two-lane country roads, have particular problems that distinguish driving on these facilities from urban travel. These include higher speeds, dimly lighted or unlighted roadways or intersections, low volumes of traffic often mixed with various types of vehicles from trucks with farm implements to normal automobiles, high percentages of trucks, driver inattention, slow emergency response—and that is critical—climatic conditions, geographic and topographic conditions, roadway types, all of which pose special demands on drivers IVHS in the urban area often does little to help. There must be more adaptions to the rural environment.

Currently information is provided to travelers in a variety of ways, many of which are readily available in the rural areas and readily operated in the rural areas.

These include primarily communications systems, most providing what we call real time pertinent information to the traveler. The real question at rural areas at high speeds is how much information the driver can assimilate and react to at any point in time.

Some of the systems that are currently being used and which we feel have particular promise in rural areas include in-vehicle systems such as localized or low frequency radio broadcasts, which are commonly used for advisory purposes; citizens' band radio, which have been popular with the truckers for many years; the standard AM or FM radio, which is available in nearly all vehicles; on-board computers which may be limited but are gaining broader use in the trucking industry and the potential is great; cartridges or cassettes which have limited use due to difficulty of keeping up to date; the in-vehicle safety and warning systems, which shows much promise in the rural environment.

Roadside types of information devices include variable message signs which are very popular and may be portable or fixed and can be revised instantaneously. The second area is permanent signs or billboards most common but the least flexible, first of all. A third are kiosks, which are much more promising due to the fact for safety purposes in that the drivers are off the road and in a safe condition. They don't have to try to drive the vehicle while they are trying to assimilate other information.

Call boxes which are in common use on many roads but they have the problem in that they are often poor quality and the driver has to leave the vehicle to use it which may create a safety problem. And then there are other dynamic signs and flashers which are in common use.

In summary, there are many evolving technologies which can and will be readily adapted to the existing transportation environment in rural areas. However, it is encumbent that we deploy some early successful projects which demonstrate to our constituents that Intelligent Vehicle Highway Systems can offer a level of safety that does not exist today.

This can be accomplished through better traveler information, safer vehicles, better incident detection and surveillance, quicker emergency response systems, and the development of new, innovative technologies. I believe there is a great synergy in our differences and we can make some truly significant improvements for the safety and convenience for those of us who travel in rural areas for our livelihood, recreation, or out of necessity.

This is a brief overview of some of the unique problems and opportunities which exist in the rural environment and I thank you for allowing me the opportunity to share these with you.

Mr. Carr. Thank you very much.

[The prepared statement of Don Kelly follows:]

STATEMENT

"THE NEED FOR INTELLIGENT VEHICLE HIGHWAY SYSTEMS IN THE RURAL ENVIRONMENT"

TO

SUBCOMMITTEE ON TRANSPORTATION and RELATED AGENCIES APPROPRIATIONS
CONGRESS OF THE UNITED STATES
HOUSE OF REPRESENTATIVES
COMMITTEE ON APPROPRIATIONS

BY

DON C. KELLY, P.E.

Chairman, Advanced Rural Transportation Systems Committee
IVHS America

Chairman, Special Committee on Transportation System Operations
American Association of State Highway and Transportation Officials

Secretary of Transportation
Commonwealth of Kentucky

April 15, 1993

Mr. Chairman and members of the Subcommittee, my name is Don Kelly and I am currently serving as Chairman of the Advanced Rural Transportation Systems Committee of IVHS America; Chairman of the Special Committee on Transportation System Operations of the American Association of State Highway and Transportation Officials; and Secretary of the Kentucky Transportation Cabinet.

I appreciate the opportunity to address you on this important topic of the Need for Intelligent Vehicle Highway Systems in the Rural Environment. My state represents a microcosm of the United States in that our population is approximately half urban and half rural; about 40% of the total travel is in rural areas; and our population is near the median. My perspective may be slightly different from some of the other speakers, as I come from an environment where I answer to a Governor, a Legislature, the media, and about 3.6 million citizens - none of whom are noted for having much patience. Thus, they expect and demand short-term returns on our investment in IVHS technologies to show some early proof of success.

Intelligent Vehicle Highway Systems have been, almost by definition, urban oriented. Relatively little information has been focused on the needs of motorists in rural areas or small towns. Yet, this large travel group needs the benefits that IVHS can foster - particularly in highway safety. Virtually everyone travels on rural highways at some point in time, and safety is the major issue which must be addressed. While only about 40 % of the total travel occurs in rural areas, more than 60% of the fatal traffic accidents occur in rural areas. As a point of information, probably the simplest and most common form of the Intelligent Vehicle is the cruise control found on most vehicles today. This device when used properly is an important factor in reducing driving fatigue; however, after midnight this device may be the most dangerous item in your vehicle as the driver may be tempted to relax too much and doze off.

Rural facilities, whether they are multi-lane, high speed, access controlled highways or narrow two-lane country roads, have particular problems that distinguish driving on these facilities from urban travel. These include higher speeds, dimly lighted or unlighted roadways and intersections, low volumes, high percentages of trucks, farm or mixed vehicle types, driver inattention, slow emergency response, climatic conditions, geographic and topographic locations, roadway types - all of these factors and more pose special demands on drivers that IVHS in the urban setting will do little to help.

Currently, information is provided to travelers in a variety of ways - largely via printed media, roadside signs, and radio, with spot application of certain more advanced technologies. This only partially meets the needs of travelers. The goal is to provide travelers with timely, accurate information relating to the various aspects of their trip:

1. Safety Considerations - hazards, enhanced visibility, obstructions, etc.
2. Emergency Services - incident management, mayday systems, medical needs, repairs, etc.

3. Enroute Services - food, fuel, lodging, campgrounds
4. Advisory Information - traffic congestion, detours, adverse weather
5. Trip Planning - route selection, mode choice, etc.
6. Enroute Attractions - scenic and recreational attractions, parks, museums, etc.
7. Regulatory Information - speed restrictions, weight limits, vehicle restrictions

There are numerous opportunities for the application of evolving technology to rural needs:

Communications by providing real time, pertinent information to the rural traveler

- o In-vehicle
  - Localized or Low Frequency Radio Broadcasts
  - Citizens Band Radio
  - Cellular Telephones
  - Standard AM or FM Radio
  - On Board Computers (Display or Voice)
  - Memory Cartridges or Cassettes
  - In-Vehicle Safety and Warning Systems (IVSAWS)
- o Roadside
  - Variable Message Signs
  - Permanent Signs or Billboards
  - Kiosks
  - Call Boxes
  - Dynamic Signs/Flashers

Printed material, telephone reservation and information systems, static highway signs, and other traffic control devices provide a large portion of the information currently used by rural travelers in driving, locating services, and satisfying the many needs encountered during a trip. Many of the more advanced systems are already technically feasible. A primary concern is keeping the cost to a level such that significant use can be made of the systems in rural areas.

There are clearly areas which require more study and concentrated effort to adequately address.

- Multi-state and/or Interstate Information Systems
- Private Sector Involvement and Public/Private Partnerships
- Interface between Urban Systems and Rural Systems
- Institutional Issues and Liability Issues
- Cross-modal Systems
- Financial and Marketing Issues
- Role of State and Local Government

In summary, there are evolving technologies which can and will be readily adapted to the existing transportation environment in rural areas; however, it is incumbent that we deploy some early successful projects which demonstrate to our constituents that Intelligent Vehicle Highway Systems can offer a level of service and safety that doesn't exist today. This can be accomplished through better traveler information, safer vehicles, better incident detection and surveillance, quicker emergency response systems, and the development of new, innovative technologies.

I believe that there is a great synergy in our differences, and we can make some truly significant improvements in safety and convenience for those of us who travel in rural areas for our livelihood, recreation, or out of necessity. This is a brief overview of some of the unique problems and opportunities which exist in the rural environment, and I thank you for allowing me the opportunity to share these with you.

STATEMENT OF HAL KASSOFF

Mr. CARR. Mr. Kassoff.

Mr. KASSOFF. Thank you, Mr. Chairman, Members of the Subcommittee. My name is Hal Kassoff. I am the Administrator of the Maryland State Highway Administration which is part of the totally integrated multimodal Department of Transportation in Maryland.

I greatly appreciate the opportunity to be here. I am actually testifying on behalf of the I-95 Corridor Coalition which I have the honor of chairing. The coalition is a very unique partnership of major public and private transportation agencies that serve the Northeast Corridor of the United States. We have 11 departments of transportation from Maine to Virginia—this is the case where Virginia is part of the north—12 toll authorities that operate major facilities within the corridor, the departments of transportation in Washington, D.C. and New York City, as well as the Federal Highway Administration. We also have representation from the Federal Railroad Administration, other elements of USDOT, their new Office of Intermodalism, AMTRAK, the American Trucking Association and so on.

We have attached to the written testimony our organizational structure as well as a list of our membership.

The mission of this very unique organization is to improve mobility and transportation efficiency in the Northeast Corridor through the application of real time IVHS technology in a coordinated and a concerted way that emphasizes two basic concepts. One is low tech. It is cooperation and teamwork. And the other is higher tech and that is technology through communication.

Although we use the I-95 designation, we really cover the entire Northeast Corridor, a broader geographic area that includes all modes of transportation that are parallel to the I-95 main spine.

I come here today really energized, enthusiastic as a result of our first major meeting just held two weeks ago of the chief administrative officers of all of our member organizations. We had a total of over 100 people in Baltimore. The purpose of the meeting was to develop our long-term business plan framework and we did succeed in doing that. We built a framework for that. We have asked our key staffs, our principal staffs to get to work on that framework and they are now doing just that, putting together a business plan that is simultaneously both visionary and practical.

Our goal is to put the I-95 corridor in the forefront as a 21st Century transportation model of technology and teamwork.

With the boost from ISTEA, as a priority corridor we have moved very, very quickly to establish our organization. Without ISTEA, we wouldn't exist.

The I-95 corridor, as you well know, from Virginia to Maine contains the bulk of concentration of high density urban population in the country: Four of the ten largest urban centers in the country, 15 percent of the total population. It is among the Nation's most congested if not the most congested travel corridor with nearly the entire corridor in nonattainment of national air quality standards.

It is served by a multi-modal system of air and rail and highway. The corridor has the highest density of freight movement in the country and includes major port facilities which have an international role in the Nation's economy.

Mr. Chairman, all of us who travel in this corridor know that there are many givens that we can accept from our experience, the first of which is that the transportation systems serving this corridor are overburdened, particularly during peak hours. They are just congested. They don't function well and they are getting worse.

It is a given that unexpected disruptions in service in this overtaxed system yields immediate gridlock. There is no slack in the system and boundless frustration among our customers. It is a given that there are some times and places in the system where there is some excess capacity that could be used but we are not always aware of where it is and how to get people to use it.

It is also a given that all modes of transportation have to work together in this corridor, in this corridor of many corridors in the country the most multimodal of all, if we are going to be able to serve this staggering demand. It is also a given, and as a highway person I am not particularly proud of this one, that of all the major modes—air, rail, and highways—the highway providers in my judgment have been the least active in terms of real time communication with their systems and coordinating intervention in the operation of their systems.

Aviation and railroads are actually ahead of the highway modes in this in area. But it is also given that the technology exists and is expanding rapidly to enable those of us who do provide highway services in the corridor to better relate and communicate with one another with other sister modes and most importantly with our customers who have a thirst for information about what is happening right now on the whole system as they are using it.

Our customers want information on the performance of the system as it affects them in a very personal way and what their options may be to cope with both systematic as well as unexpected interruptions in service.

We succeeded in planning and financing and constructing a breathtaking web of interconnected lines of transportation service and some of us—and as I mention, the common carriers and some of the toll authorities have established a tradition of communicating with their customers on a real-time basis, but we have largely confined our purview to what we individually own, what we alone finance and what we are ourselves maintain.

Ironically, our pavements and our bridges have touched at the borders of our domains while we as transportation professionals in many cases have not. The reality of the I–95 Northeast Corridor is that it is highly fragmented. Unlike other highway travel corridors of the country which are contained in just a few States or in a number of cases just within one State, within our corridor are no less than 25 organizations responsible for just the interstate highways and major toll roads, not to mention the other modes.

We have implemented a magnificent collection of individual modal systems—highways, railroads, airlines—but this collection will not be a fully effective system until we can communicate, interact, respond, adjust, and inform as real-time conditions warrant.

Our vision for the coalition is really very simple, though the implications may be far-reaching. Our vision is for the providers of transportation services in the I–95 corridor from Richmond, Virginia, to Portland, Maine, to establish the necessary communication links so that collectively as individual entities and as a coordinated team, we might operate our individual parts of the system for the benefit of travel customers whose travel extends beyond our individual boundaries.

Our vision is customer-driven. It is focused on communication with customers and with each other and it is based on the concept that we must coordinate the operation of each of our pieces of the system.

While our coalition has cooperatively accomplished a great deal in the few months that we have been organized, the real major challenges are yet to come. Our business plan will be ready in May, next month, and it will provide a detailed basis for the coalition and its member agencies to begin our real work.

Mr. Chairman, Members of the Subcommittee, we would be pleased to brief you on this business plan after it is finalized next month and we would be happy to present it to you in any form you might choose.

Mr. Chairman, you and your colleagues in the Congress have demonstrated your recognition of the critical Federal responsibility in advancing IVHS applications for the transportation system. And nowhere is that more important than in the multi-State interstate Northeast Corridor.

I thank you for the assistance that you have given that has made this coalition possible. We look forward to your continuing support for the IVHS program in general and for the particular needs of multi-State and multimodal corridors such as ours. I would be happy to answer any questions after my colleagues' testimony.

Mr. CARR. Thank you, Mr. Kassoff.

[The prepared statement and biography of Hal Kassoff follows:]

TESTIMONY of HAL KASSOFF

Administrator, Maryland State Highway Administration
And
Chairman, I-95 Corridor Coalition

To the House Committee on Appropriations
Subcommittee on Transportation and Related Agencies Appropriations

April 15, 1993

Testimony of Hal Kassoff
House Committee on Appropriations
Subcommittee on Transportation & Related Agencies
April 15, 1993

Mr. Chairman, my name is Hal Kassoff, and I am the Administrator of the Maryland State Highway Administration. Thank you for the opportunity to testify before you today. I am here on behalf of the I-95 Corridor Coalition which I have the honor to chair. The I-95 Corridor Coalition is a partnership of the major public and private transportation agencies which serve the Northeast Corridor of the United States. Included in the Coalition are each of the 11 Departments of Transportation in the Corridor stretching from Maine to Virginia, 12 toll authorities that operate major facilities within the corridor, the transportation departments of Washington D.C. and New York City as well as the Federal Highway Administration. In addition, we have representation from the Federal Railroad Administration, the USDOT Office of Intermodalism, AMTRAK and the American Trucking Association Foundation. I have attached to my testimony a list of the current member agencies as well as a copy of our organizational structure.

The mission of the Coalition is to improve mobility and transportation efficiency in the Northeast Corridor through the application of real time IVHS technology in a coordinated and concerted way that emphasizes cooperation and communication, technology and teamwork. Although our Coalition uses the I-95 designation, we cover a broad geographic area in the Northeast which includes all modes, as well as all major free and toll highways which parallel I-95.

While the ISTEA legislation contains a wide array of progressive changes affecting surface transportation in the United States, I would like to concentrate on what I believe is among the most visionary and forward looking provisions, the IVHS sections of Title VI-Part B. The Intelligent Vehicle-Highway System program (which might better be called Intelligent Transportation Systems), will provide us with a "smarter" intermodal surface transportation system utilizing technologies that are just beginning to emerge in the civilian sector of our economy--technologies that will invite crossovers into the civilian sector by companies that have in the past been almost exclusively defense oriented.

I come to this meeting both enthused and focused as the result of a two day Workshop of the Chief Administrative Officers of the Coalition held in Baltimore two weeks ago. Over 100 people including the CAO's and their key staff met for two days to begin to turn our idea for cooperation into a plan of action. The goal of the Workshop was to develop the framework for both a short and long term Business Plan for the entire corridor which each of our respective agencies could endorse. We succeeded in defining such a framework and are now well on our way to producing a specific business plan that is simultaneously visionary and practical for making the I-95 Corridor the 21st Century's transportation model of technology and teamwork.

With the boost from ISTEA, which cited I-95 as a "priority corridor", we have quickly moved to establish our organization. We have created a structure which includes an Executive Board made up of the CAO's of the transportation agencies in the corridor and a Steering Committee which includes key policy and senior technical staff from each of our members. We have expanded the geographic scope of the corridor as defined in ISTEA to include Virginia, Rhode Island, Massachusetts, New Hampshire and Maine.

The I-95 Corridor from Virginia to Maine contains four of the nation's ten largest urban centers with a population of over 40 million people, roughly 15 percent of the total U.S. Population. It is among the nation's most congested travel corridors, with nearly the entire corridor in non-attainment of national air quality standards. The corridor is highly urban and multimodal, with transportation provided by numerous public and private modes. The Corridor has the highest density of freight movements in the country and includes the largest port facilities on the East Coast which are vital to this nation's economy.

It is a given that the transportation systems serving this corridor are overburdened, particularly during peak travel periods, and are getting worse. It is a given that unexpected disruptions in service on an already overtaxed system yields gridlock and boundless frustration among our customers. It is a given that there are times and places in the corridor when excess capacity could be used to relieve our overburdened system -- particularly during unanticipated disruptions. It is also a given that all modes of transportation must be used to their best advantage to serve this staggering demand. It is a given that among the principle modes of transportation -- air, rail, and highways, the highway providers have been the least active in terms of real time communication and coordinated intervention in system operations. And, it is a given that the technology exists and is expanding rapidly to enable those of us who provide highway transportation services, to better relate and communicate with one another, with our sister modes, and most importantly with our customers, who have a thirst for information about what is happening right now on the whole system. Our customers want information on the performance of the system as it might affect them, and what their options may be to cope with both systemic and unexpected interruptions in service.

We have succeeded in planning, financing and constructing a breathtaking web of interconnected lines of transportation service -- and some of us -- especially the common carriers and the toll authorities, have already established a tradition of communicating with customers on a real time basis. But we have largely confined our purview to what we individually own, what we alone finance, and what we ourselves maintain. Ironically, our pavements and our bridges have touched at the borders of our domains, while we as transportation professionals, in many cases, have not.

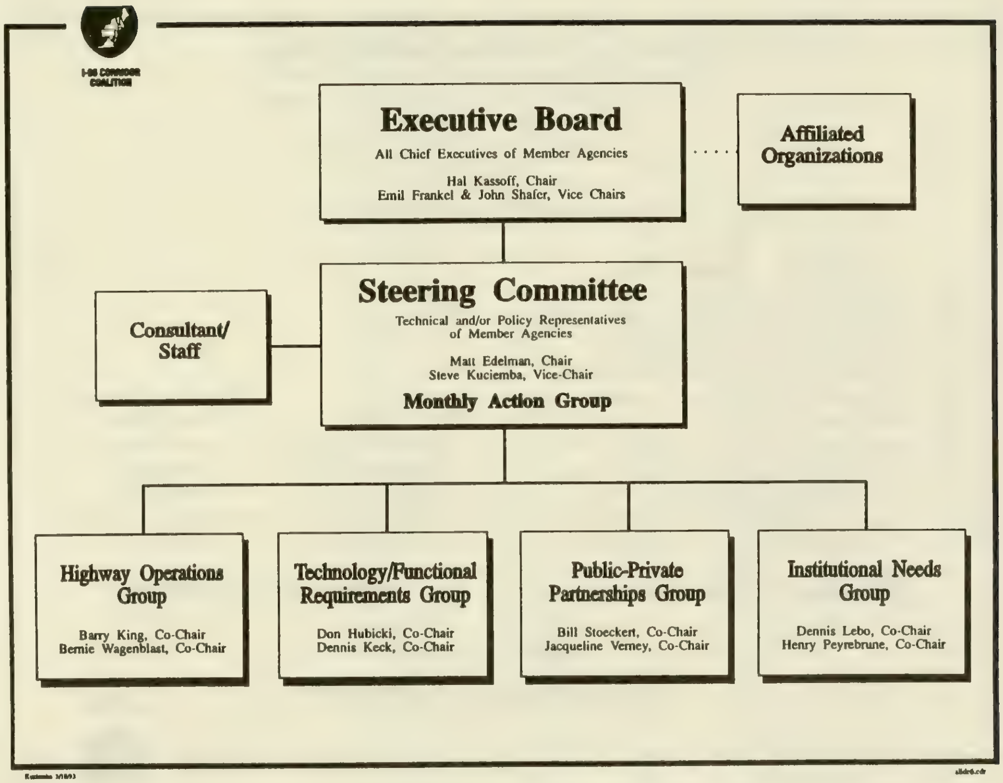
The reality of the I-95 Northeast corridor is that it is fragmented. Unlike other highly travelled corridors of the country which are contained in just a few states, or even within one state, within our corridor are no less than twenty-five organizations responsible for Interstate highways and major toll roads. We have implemented a magnificent collection of individual modal systems -- highways, railroads, airlines -- but this collection will not be a fully effective system until we can communicate, interact, respond, adjust and inform as real time conditions warrant.

Our vision for our Coalition is really fairly simple, though the implications may be far-reaching. Our vision is for the providers of transportation services in the I-95 Corridor - from Richmond to Portland - to establish the necessary communications links so that collectively - as individual entities and as a coordinated team - we might operate our part of the system for the benefit of travel customers whose travel extend beyond our individual boundaries. Our vision is customer driven, it is focused on communication with customers and with each other, and it is based on the concept that we must coordinate the operation of each of our pieces of the system.

There is already early evidence that we can succeed. Before we were officially launched, our staff began to build informal communication links through phone and fax. Already, in our brief history, southbound travelers in New York and New Jersey have been advised of long term service disruptions at strategic locations in Pennsylvania, Delaware, Maryland, and Virginia. Northbounders in Connecticut have been notified of unexpected incidents in Rhode Island and Massachusetts. And residents in Maine and New Hampshire have been advised that perhaps it's not such a good idea to go very far south during the Thanksgiving holiday. Having demonstrated the ability to voluntarily establish a "grass roots" effort, we are now ready to progress to the next level - through the application of advanced technology.

While our Coalition has cooperatively accomplished a great deal in the few months that we have been organized, the real work is yet to come. Our Business Plan will be ready in May and it will provide a detailed basis for the Coalition and its member agencies to begin our work. Mr. Chairman, we would be pleased to brief you on our Business Plan after it is finalized in May, since your interest in and support for IVHS and our Coalition is pivotal to our success.

Mr. Chairman, you and your colleagues in the Congress have demonstrated your recognition of a critical Federal responsibility in advancing IVHS applications for the transportation system in our vital Northeast Corridor through your support of the I-95 Coalition. I thank you for the assistance that the Congress has given. Our Coalition members look forward to your continuing guidance and support. We still have many questions to address. For example, we will soon have to face the extremely tough issue of how to allocate funds and how to share costs. But our overall mission is now before us, and with your continued support we can and we will make the transportation system of the Northeast Corridor a prime example of what cooperative and coordinated actions can do to achieve real breakthroughs in teamwork and technology. Thank you, and I would be pleased to answer any questions you may have.


I-95 CORRIDOR COALITION
Executive Board
All Chief Executives of Member Agencies
Hal Kassoff, Chair
Emil Frankel & John Shafer, Vice Chairs
Affiliated Organizations
Consultant/ Staff
Steering Committee
Technical and/or Policy Representatives of Member Agencies
Matt Edelman, Chair
Steve Kuciemba, Vice-Chair
Monthly Action Group
Highway Operations Group
Barry King, Co-Chair
Bernie Wagenblast, Co-Chair
Technology/Functional Requirements Group
Don Hubicki, Co-Chair
Dennis Keck, Co-Chair
Public-Private Partnerships Group
Bill Stoeckert, Co-Chair
Jacqueline Verney, Co-Chair
Institutional Needs Group
Dennis Lebo, Co-Chair
Henry Peyrebrune, Co-Chair
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I-95 CORRIDOR COALITION

Coalition Membership

as of February 1993

13 State & Local DOT's

- Virginia
- District of Columbia
- Maryland
- Delaware
- Pennsylvania
- New Jersey
- New York City
- New York
- Connecticut
- Rhode Island
- Massachusetts
- New Hampshire
- Maine

12 Transportation Authorities

- Delaware Turnpike Admin
- Maryland Transportation Auth
- Penn Turnpike Commission
- New Jersey Hwy Auth/Garden State Pkwy
- New Jersey Turnpike Commission
- Port Auth of New York/New Jersey
- New York State Thruway
- Delaware River & Bay Auth
- Delaware River Port Auth
- Triborough Bridge & Tunnel Admin
- Massachusetts Turnpike Authority
- Maine Turnpike Authority

6 Other Related Organizations

- TRANSCOM
- Federal Highway Administration
- Amtrak (ex-officio)
- American Trucking Association (ex-officio)
- Federal Transit Administration (ex-officio)
- Federal Railroad Administration (ex-officio)

Kuciemba 2/2/93

BIOGRAPHICAL INFORMATION FOR
HAL KASSOFF

Since becoming Administrator in 1984, Hal Kassoff has guided the State Highway Administration through a dramatic period of investment by managing over $5 billion in bridges and pavement restoration, safety improvements, and completion of critical Interstate and primary highways from Western Maryland to the Eastern Shore. Hal has aggressively pursued implementation of an interconnected, intermodal Baltimore-Washington Transportation Grid. He also initiated Maryland's nationally recognized Traffic Management program known as CHART. During his tenure, SHA has been recognized on numerous occasions for its environmental programs.

Under Hal Kassoff, SHA has embraced Total Quality principles of customer service, employee involvement and continuous improvement. SHA has won awards for productivity and teamwork.

Before coming Administrator, Hal was SHA's Director of Planning & Preliminary Engineering. In prior years, he managed Maryland's public transportation programs in the Washington area. Hal began his career at the Federal Highway Administration.

Hal Kassoff holds degrees in Civil Engineering and Transportation from New York's City College and Northwestern University. He has authored numerous papers and articles, and chairs an innovative national civil engineering careers program, as well as the I-95 Corridor traffic management coalition. Among his awards are Maryland's "Engineer of the Year" in 1987 and the Mathias Award for Outstanding Public Administration.

April 1993

STATEMENT OF JOHN GRUBBA

Mr. CARR. Our next witness will be John Grubba, Deputy County Executive of Oakland County, Michigan, and I am proud to say one of our Michigan experts in IVHS.

Mr. GRUBBA. Thank you very much, Mr. Chairman. I have a written statement which I have given to you for the record. I want to talk about local government involvement in IVHS and the experience that we have with the FAST-TRAC project in Troy, Michigan.

At your invitation, Mr. Chairman, we have brought a display of the FAST-TRAC advanced traffic management system which is to my left. That is not a videotape, that is the actual operation of the system that is in progress in Troy going on now.

The engineer behind has a computer with him. From here he can control all of the signals and each of the signals on the system. That is not very important and you wouldn't want to do it from Washington, D.C., but he does take that computer home with him at night and can respond to breakdowns in the system from home through his computer and that saves us an enormous amount of overtime. His wife doesn't like it very much, though.

The FAST-TRAC as you know is a large scale operational test of an integrated advanced traffic management system and an advanced traveler information system. The principal technologies are the Sydney Coordinated Adaptive Traffic System that controls the signals of the Autoscope video image processing system that Dr. Braun spoke about earlier.

These two systems give us a traffic control system that actually sees the traffic at each of the intersections and respond second-by-second to the change in the traffic flow and can even skip entire cycles if that is necessary.

And also the third system is the Ali-Scout Dynamic Route Guidance System. If any of the Members of the subcommittee or staff is interested in seeing a demonstration, Mr. Akey will be happy to do that for you.

This is a complete traffic management system that responds in real time to changes in traffic conditions and by integrating SCATS with the Autoscope machine vision system, as I said, these signals see and respond immediately. And when we combine this with the Ali-Scout Dynamic Route Guidance System which guides drivers to the destination in the least amount of time, we think we have the most sophisticated IVHS system in the world.

By June of this year, we will have close to 100 intersections in the City of Troy included in the system. 30 Ali-Scout infrared roadside beacons will be communicating with the 60 specially-equipped vehicles. And these systems, as I say, are now in operation on the streets in Troy. In the next year we will have 200 SCATS intersections and 40 beacons on our neighborhood and we will be well on our way toward the actual integration of the two systems so they will exchange information with one another.

That will allow, for example, at a saturated intersection the SCATS or the Ali-Scout system will begin diverting vehicles around the congested intersection or road segment thus allowing the congestion to dissipate much more quickly.

We learned a great many lessons over the past two years. First of all, I think most important from my point of view that local governments can deploy, operate these systems and that local governments have got to get more deeply involved in IVHS.

Organizations like ours have jurisdiction and responsibility for the traffic control systems that are on our roads now. Without the involvement of local government in IVHS, the industry will not prosper and the promise will flounder.

Our experience has found that local governments are very interested in IVHS. The county of Oakland, as you know, Mr. Chairman, put the first $2 million local funds into the FAST-TRAC project to get it under way and your committee has been funding the program since.

But two of our cities that are involved, Auburn Hills has by resolution pledged $650,000 for matching funds for the deployment of the system that will come in next year. The City of Rochester Hills council has pledged over $700,000 in matching funds next year when we deploy there. The City of Pontiac has pledged $225,000 in local funds for a matching program.

In addition to that, even in local communities that are not in line for immediate deployment are specifying SCATS, traffic controllers in all of the upgrading and modernization in their cities in anticipation of the project eventually reaching their cities. Even small rural communities, my home village of Milford has deployed advanced SCATS controllers and we may deploy a separate system in that rural area to test the advantages of the system in a more rural environment.

In addition to that, the—in this age of environmental consciousness, local officials and environmentalists in Oakland County see these technologies as a clean way to provide better traffic flow and safety in their communities and much of the environmental movement has been the result of backyard environmentalists who are opposed to anything that may adversely impact their neighborhoods.

We have brought groups of environmentalists to our traffic operations center and explained to them the project and I am pleased to report that it has received almost unanimous endorsement and support.

The other area that I would like to comment upon, as you know, Mr. Chairman, in Oakland County, we have 63 local governments, 20-some of these are cities that have control of traffic signals. The Michigan department of the transportation, of course, has control of the traffic signals on the State system that is in our county and the county road commission has jurisdiction over the other signals. We have about almost 2,000 traffic signals in the county, 1,200 under county jurisdiction and the rest under cities and the State.

We have found no problem in integrating the IVHS over the traffic control system. As a matter of fact, we used the very same contract with local units of government that we have been using for some 30 years. These local jurisdictions have been operating traffic control systems in a coordinated cooperative way since they were invented. And they see IVHS as simply adding new technology to an already established system.

As I say, we have had no breakdown in discussion of who is running the system, whose responsibility is the liability. Questions have been settled for decades through courts and the SCATS system fits in with the ongoing traffic control conversation that local units of government have with one another day in and day out.

We also realized some improved efficiencies in our operations. From our traffic operations center, we can monitor the traffic conditions and signal systems operations. When we see a problem in either of these areas, we can usually correct the situation from the operation center.

For example, on March 29th, we had a detector malfunction that resulted in a two-mile backup on a major corridor in Troy. We detected the malfunction from the operation center shortly after 7:00 a.m. We used video cameras to verify the problem and once verified, we changed the signal time to go clear the backup from the operation center. Within 10 minutes the backup was gone and traffic conditions were improved for the rest of the rush hour.

Another example of improved operations involves our vehicle detection system. Our SCATS system relies on video image processing for vehicle detection and since last spring we have had only one video camera fail. Our work crew was able to replace it in a half-hour without blocking traffic. If an inductive loop had failed, it would have taken a half day to repair and a traffic lane would have been closed for at least a day.

The county, as I said, we are expanding the program. The county of Oakland general government will contribute office space for a permanent traffic operations center in fiscal year 1994. The new operations center will be located next to the county sheriff's dispatch center and will be integrated with that center facilitating traffic control and police services.

We will integrate the controlling center with the county's emergency vehicle medical vehicle operation. And we have been—we have opened conversations with our transit agency to integrate a transit element in the program, though we hope to improve the emergency vehicle response times and provide the public with traffic information needed to avoid lane blocking incidents and public transportation will benefit from our efforts by using our traffic information to reduce transit times.

We will in 1994 integrate the surface street traffic control system with the freeway operations and controls in the Silverdome area. We want to do that because in June of 1994 the Silverdome will be the site of the World Cup soccer matches and we plan to have the system in effect in that area in June of 1994.

That concludes my remarks, Mr. Chairman, and I want to express our deep appreciation for your personal support and the support of this Committee for this project and I think it has proven—given us many lessons for other local units of government to get involved in the IVHS industry, because we do have to build and promote and establish an IVHS industry in the United States and the IVHS America has that as one of its major goals.

Thank you, Mr. Chairman.

[The prepared statement of John Gubba follows:]

Statement of John L. Grubba
Executive Office
County of Oakland, Michigan
U.S. House of Representatives
Committee on Appropriations
Subcommittee on Transportation

April 15, 1993

SUBJECT: LOCAL GOVERNMENT INVOLVEMENT IN IVHS - THE FAST-TRAC EXPERIENCE

For the past two years, I have been involved in the FAST-TRAC IVHS Program in Oakland County, Michigan. I am pleased to report that the program is moving ahead smoothly, and much of the credit for our success belongs to you.

For those of you who are new to this committee, FAST-TRAC is a large scale operational test of an integrated Advanced Traffic Management System and an Advanced Traveler Information System.

The principal technologies involved in this integrated system include:

- The Sydney Coordinated Adaptive Traffic System.
- The Autoscope video image processing system, and
- The Ali-Scout dynamic route guidance system.

We have set up a real-time demonstration of our SCATS system in this room and I hope that you have an opportunity to see it up close.

SCATS is a complete traffic management system that responds in real-time to changes in traffic conditions. By integrating SCATS with the Autoscope machine vision system, we have traffic signals that actually see and respond. Combine this with the Ali-Scout dynamic route guidance system that guides drivers to their destinations in the least amount of time, and you have probably the most sophisticated IVH system in the world.

By June of this year, close to 100 intersections in the City of Troy, Michigan will be included in our SCATS coordinated, adaptive traffic control system. We will also have installed 30 Ali-Scout roadside beacons for communicating with 60 specially equipped vehicles. These systems are now being operated from a state-of-the-art operations center in Troy.

Over the next year, we will have 200 SCATS intersections and 40 beacons on our network. We will be well on our way toward the integration of these systems, making FAST-TRAC the first program in the world to integrate an advanced traveler information system with an advanced traffic management system.

FAST-TRAC has brought a number of firsts to the IVHS community. We are the first to integrate machine vision with adaptive coordinated traffic control. We are the first in the western hemisphere to deploy the SCATS fully adaptive, coordinated traffic control system. We are the first to install and test a beacon-based traveler information system in the United States. We are the first to test the use of infra-red beacons to communicate traffic data to specially equipped vehicles. We are the first to house the central controls for an advanced traveler information system and an advanced traffic management system in the same operations center. We are the first local road agency to undertake a program of this scope and magnitude.

We've learned a great many lessons over the past two years. First of all, we believe that local governments must get more deeply involved in IVHS. Organizations like ours have jurisdiction and responsibility for traffic control systems on most of the roads we travel. Without the involvement of local governments, IVHS will not prosper and the promise of an IVHS industry will flounder.

Our experience has found that local governments are interested in IVHS. The FAST-TRAC program is a product of local initiative. It originated as a "bottom-up" strategy for solving the mobility and highway safety problems in Oakland County. Consequently, our program has considerable local support. The problem has been finding sufficient local funding.

Granted, many local officials have taken a wait-and-see posture. This skepticism is healthy since local elected officials are responsible to the taxpayers. Many of these officials are savvy enough to understand that they must wring as much capacity as possible out of their existing roads before they can ask the taxpayers to cough up millions of more dollars for road widening projects, for instance. Some are even looking at systems such this as a way to offset or at least defer costly construction projects.

In this age of environmental consciousness, local officials also see IVHS technologies as a "clean" way to provide better traffic flow and safety in their communities. Much of the environmental movement has been the result of "backyard" environmentalists who are opposed to anything that may adversely impact their neighborhoods. Systems such as this hold promise to reduce negative neighborhood impacts.

The Road Commission for Oakland County is the principal partner in the FAST-TRAC program. The Road Commission is responsible for the management, administration, and implementation of the program. This role was new to us, and as a small organization, has stretched our resources in a number of areas.

First, we have found that federal and state procurement regulations have placed added burdens on us. We have been able to overcome much of the burden by developing some standard contracts and procedures. As a result of our new-found expertise in this area, we have even been asked by IVHS America to help teach a special seminar on "How to Get Started in IVHS Contracting".

One of the main problems we have run into involves contracting with firms who are used to dealing directly with the Department of Defense. Federal trade secrets regulations protect financial information from getting into the hands of competitors. However, state and local regulations place this information in the public domain, where it can be accessed by anyone. This poses a problem when entering negotiated contracts with highly specialized firms with expertise in IVHS. Instead, we are forced into a position of bidding all services because fixed priced contracts are not subject to the same rules. Public-private partnerships are difficult to enact under this scenario.

This scenario also requires us to develop very precise specifications for highly technical work. Local governments such as ours rarely have staff with the skills necessary to perform this function. Not only that, but the requirement to bid all services places an additional administrative burden on these organizations.

Our goal has been to try to administer our program with existing staff. This has been difficult, given the nature of the work and the breadth of reporting required. First, few people have the skills necessary to make projects like this work. Consequently, we over-rely on those who have this knowledge. We need to build redundancy in-house. Secondly, the amount of reporting and record-keeping required by the state and federal governments is tremendous. We must not only keep financial records, we must also do monthly committee minutes for all subcommittees, monthly and quarterly status reports, special reports on technical issues, cost-benefit analyses, work plans, work orders, and work order documentation. The number of requests for proposals, bids, and contracts is immense, and these things require highly skilled personnel.

In summary, it has been difficult to accomplish all of this with existing staff. If other local road agencies are expected to do what we are doing, then these issues must be addressed.

Another issue that continues to pop up in IVHS discussions is that of liability. While product liability is a concern, especially in the area of advanced vehicle control systems, it has not been an issue in our program. We have experienced a dramatic spirit of cooperation among the participants in our program and across multiple jurisdictions. This cooperation tends to overcome liability concerns.

I have been focusing primarily on non-technical issues. But we have also learned quite a bit from the technical perspective.

We are now in the process of evaluating the benefits and costs of our program. We have learned that we can significantly reduce travel time with adaptive control. In one corridor, we were able to reduce travel time by 4% to 11% during different times of the day after our SCATS system replaced a fixed time, coordinated signal system.

We have also realized improved efficiency in our operations. From our Traffic Operations Center we are able to monitor traffic conditions and signal system operations. When we see a problem in either of these areas we can usually correct the situation from the operations center. For example, on March 29th we had a detector malfunction that resulted in a two mile back-up on a major corridor in the City of Troy. We detected the malfunction from the Traffic Operations Center shortly after 7:00 A.M. We used video cameras to verify the problem, and, once verified, we changed the signal timing to clear the back-up from the operations center. Within ten minutes, the back-up was gone and traffic conditions were improved for the rest of the rush hour.

In other cases of improved operations, we have been able to detect equipment problems and dispatch crews immediately to those locations. Under our old system, we would have to rely upon local police or a good-samaritan to let us know about a "lamp out", for example.

Another example of improved operations involves our vehicle detection system. Our SCATS system relies on video image processing for vehicle detection. Since last spring, we have had only one video camera fail. Our work crew was able to replace it in 1/2 hour without blocking traffic. If an inductive loop would have failed, it would have taken 1/2 day to repair and a traffic lane would have been closed for at least a day.

This is not to say our system is perfect. We have had some glitches, but most have been overcome. One problem involved the sensitivity of the video detectors. We found that the system was not always seeing every vehicle. This happened mostly at night. We were able to correct this problem by providing more street lighting and better camera optics.

We will use the knowledge that we have gained from our experience to continue to expand the state-of-the-art in IVHS. Our FY94 program will involve adding an additional 100 traffic signals to our adaptive control system. In addition, we will expand the coverage of the Ali-Scout dynamic route guidance system with 60 additional beacon sites. Our objective is to equip 1,000 vehicles with Ali-Scout equipment.

The County of Oakland will contribute office space for a permanent traffic operations center in FY94. The new operations center will be located next to the Oakland County Sheriff dispatch center, facilitating integration of traffic control and police services. We will also include data linkages with local and state police and public transportation agencies. We hope to improve emergency vehicle response times and provide the public with traffic information needed to avoid lane-blocking incidents. Public transportation will benefit from our efforts by using our traffic information to reduce transit times.

The permanent traffic operations center will provide the focal point for our pioneering systems integration work. Our efforts will focus on the integration of advanced traveler information systems with advanced traffic information systems. We will pull in data from a variety of sources and transform it into useful information for the traveling public. This information will then be disseminated over a variety of media, including cable TV, radio, kiosks and our Ali-Scout system.

We will also begin the deployment of a state-of-the-art communications network for our systems. We have established a communications task force to delve into the issue of communications requirements for the FAST-TRAC program.

Our FY94 work plan will concentrate on a major event of international significance. In June of 1994, the Pontiac Silverdome will be the site of four World Cup Soccer matches.

Visitors from all over the world will converge upon Metropolitan Detroit for these games. We are now working to deploy the advanced traffic management system in the Silverdome area, but a great deal of other work must be completed by June of 1994 to assure that our international guests can get to the games safely and conveniently.

Part of our FY94 plan is to integrate the surface street traffic control system with freeway operations and controls in the Silverdome area. This would allow us to manage the traffic within a broad radius of the Silverdome for the greatest efficiency. For example, motorists on the freeway would be informed of the best routes to the Silverdome. Detection systems on the freeway would be linked to the traffic control system on the local streets. In this manner, the traffic control system would immediately respond to an expected influx of traffic. Under-utilized portions of the road network would be more efficiently utilized, and those that are over-utilized would experience freer flow.

We anticipate that the courtesy vehicles for visiting VIP's will be equipped with Ali-Scout dynamic route guidance systems. Part of our plan is for the acquisition of these systems and their installation in the courtesy vehicles. We estimate that 50 or more vehicles might be involved in this program.

Our promise to you is that we will continue to increase the IVHS knowledge base through our program.

Mr. CARR. Thank you, Mr. Grubba, and I want to give a special thank you to you and to Mr. Akey for the display today. I know that that took a little extra effort and we appreciate you doing that for us and giving the Committee an opportunity to see firsthand what the Committee has helped to fund. And I will have some more questions about some of that.

Mr. Bergoffen.

STATEMENT OF GENE BERGOFFEN

Mr. BERGOFFEN. Mr. Chairman, I am Gene Bergoffen, Executive Vice President of the National Private Truck Council. On behalf of the private trucking community, we appreciate the emphasis you are giving to commercial vehicle operations and IVHS activity, and especially the privilege of being here with you today.

NPTC is the national organization that represents companies who are not in the trucking business, but who operate truck fleets that support their business activity. Our fleets range in size from 10 to over 4,000 and these are the truck fleets that are the largest segment of trucking today.

NPTC aggressively supports programs and progress in IVHS activities that help commercial vehicle operations. We are strong supporters of IVHS America and participate fully in the ongoing demonstration and developmental projects related to commercial vehicle operations. The greatest potential for IVHS/CVO is implementation of a nationwide commercial vehicles network where trucks can voluntarily travel the Nation's highways just as cars do without stopping at State borders and weigh stations.

Vital safety and regulatory checks can be made with technology automatically at highway speeds and without delays. Truck fleets will be able to apply to and supply standard uniform data to a single State and their safety tax and registration information can be placed in a computer record accessible nationwide. More on that soon, but first I want to put in a plug for IVHS America.

This unique organization of Federal-public sector-private sector partnership has already yielded many benefits for trucking nationwide. I want to congratulate the staff of the Federal Highway Administration, DOT, the Office of Motor Carriers. The key thing is that they have listened, listened well through a CVO technical committee of this organization and developed a program that really is responsive to needs. And this responsiveness is a model of Federal-private sector cooperation. I want to thank you, too, Mr. Chairman and Members of the Committee, for your support of IVHS/CVO activities.

On the national commercial vehicle network at this meeting of IVHS America the CVO Technical Committee has met to review and assist the Department of Transportation in developing an exciting Federal initiative, a nationwide commercial vehicle network. As set out in a concept paper developed by the Department of Transportation, the ongoing Crescent/Help, Advantage I–75 and the upcoming new Interstate 80 demonstration projects can be linked, and to quote DOT: "By automating these corridors and encouraging expansion of IVHS technologies on other interstates, a fully automated network that will allow trucks to move as freely as cars could become a reality by 1998.".

This network would be built around several important service areas including safety, credential and reporting practices, hazardous material monitoring and response, fleet management, and cross-border truck transportation. We urge your Committee and other IVHS program authorizing and appropriations committees to focus on this vital national network concept. The vision is clear and simple. And if we all keep it in mind, the rest of the pieces of the puzzle will quickly fall more neatly into place.

I serve on the Policy Committee of the Advantage I–75 project. This project is setting a remarkable standard for Federal-State-private sector cooperation. I want to thank Don Kelly who is sitting on this panel for his leadership and that of others on the project for making this happen. The Advantage I–75 is building well on the lessons of earlier projects and is setting the stage for more progress in the Interstate 80 corridor.

Three years ago the commercial motor fleet community was very skeptical about the prospect of six States including, Mr. Chairman, your State of Michigan, very skeptical that they could actually agree to recognize each other's State or provincial clearances and set of credentials. Now it is happening. Not all the bugs have been worked out and the concept is a long way from meeting its full potential, but it is on the way.

These ongoing projects wouldn't have happened without the congressional support and vision and Department of Transportation leadership and funding, and the good will of the IVHS and the participants. We urge you to continue the financial support and vision for these programs while we put the national network into place. Keep the demonstration projects going so we can create the national network, then we will be in a position to operate it nationwide with concentrated attention and adequate funding. We are going to realize early winners and deployment rather than just demonstration will be just around the corner. There is no question that there are many State-to-State, and even within States agency-to-agency, barriers yet to cross.

You have heard a little bit about that from the rest of the panel today. I put an attachment on here that should make all of us to throw up our hands if you look at it and consider one process of one part of commercial vehicle registration. And taken as a whole across the States and within States, these processes can seem overwhelming. So we need strong, unrelenting Federal leadership to make sure that we can develop a simple national database communications system to support the network nationwide and it is more than doable.

I think about how bank cards can now be read on automated teller machines not only across town but across the country and overseas. Even the Internal Revenue Service has become more customer friendly and you can file a tax return electronically. And I have attached a concept of how this might be done in a commercial vehicle network. I am certain that the States will, too, save money when this network is in place. But we are all going to have to stick together. Please don't mistake our excitement about IVHS/CVO as blanket endorsement of all proposed uses or approaches of CVO.

In many respects, the accelerated funding for IVHS has led to a large number of solutions, products, without a problem; that is, a real market need. We should carefully focus on the concepts outlined above. If we keep our eye on that network, and get that done, we are going to skirt the waste or the pork, if you will, that could be associated with any large new Federal funding initiative. And we should also avoid activities where the competitive business environment has already moved such as fleet management technology, satellite tracking and mobility communications and a number of other things that are happening before IVHS America, before the funding and will happen regardless because they make sense, they are cost-effective and they are needed. And we want to stress the participation in the national network will happen much quicker if it is voluntary, not mandatory. The system will yield so many benefits to safe and productive fleet that it will be easily accepted and would help the State highway systems to focus on those operators who are less safe. And we don't want to see this become a tool for unwarranted and accelerated enforcement activities where they are not warranted, but we think we can handle that on a cooperative bases.

We want to be sure that IVHS/CVO benefits help trucking activities nationwide. Relatively a small portion of the total truck population will travel significant portions of the nationwide network. Most will work within a 200-mile radius and not travel the interstates. We see benefits for these operations as well, including a uniform national database and communication system, traffic congestion information and toll collection devices. Please keep all of these fleets in focus as you consider the dramatic applications for longer hall fleets.

We appreciate your focus on these vital new world for vehicle operations and we urge you to support a nationwide commercial vehicle network and continue vigorous funding of the demonstration projects that will allow the network to reach deployment and encourage a national database and communications to support it, and be wary of programming that will cause us to lose focus on the goal or will not solve our real problem. Thank you for this opportunity.

[The prepared statement and biography of Gene Bergoffen follows:]

NATIONAL PRIVATE TRUCK COUNCIL
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STATEMENT OF

Gene Bergoffen
Executive Vice President
National Private Truck Council

on

INTELLIGENT VEHICLE HIGHWAY ISSUES
COMMERCIAL VEHICLE OPERATIONS

before the

Subcommittee on Transportation and Related Agencies
Committee on Appropriations
United States House of Representatives

Washington, DC
April 15, 1993

William Carroll, President
DTF Trucking, Inc Toledo, OH

Roger Hurley, Vice President
Perdue Farms, Inc Salisbury, MD

Richard F. Golden, Vice President
Phoenix Distributors Conyers, GA

David A. Tarr, Vice President
Pet Incorporated St. Louis, MO

Peter Gratale, Vice President
Cone Mills Corp Greensboro, NC

Ralph Hamilton, Treasurer
National Welders Supply Co. Charlotte, NC

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE:

I am Gene Bergoffen, Executive Vice President of the National Private Truck Council (NPTC). On behalf of the private trucking community, we appreciate the emphasis you are giving to commercial vehicle operations and IVHS activity, and the privilege of presenting our views today.

NPTC is the national organization exclusively representing companies who are not in trucking as a business in itself, but who operate truck fleets that support their main business activity, including manufacturing, processing, distribution, warehousing, retail and services. Our fleets range in size from under 10 units to over 4000. These are the truck fleets that are the largest segment of trucking today, and that feed, fuel, and provide vital products and services to America's Consumers.

Our Views in Brief

- NPTC aggressively supports progress in IVHS activities that facilitate commercial vehicle operations. We are strong supporters of IVHS America, and participate fully in ongoing demonstration and developmental projects relating to commercial vehicle operations (CVO).
- The greatest potential for IVHS/CVO is implementation of a **Nationwide Commercial Vehicles Network**, where trucks can voluntarily travel the nation's highways just as cars

do, without stopping at state borders and weigh stations. Vital safety and regulatory checks can be made with technology, automatically, and without delays. Truck Fleets will be able to apply to and supply standard, uniform data to a single state, and their safety, tax and registration information can be placed in a computer record accessible nationwide.

- Current CVO demonstration projects, funded heavily with Federal IVHS grants, must go forward vigorously. The HELP\Crescent project has yielded important information. Advantage I-75 is ready to launch the first-ever multi-state truck preclearance activity, allowing fleets to be weighed in motion, and bypass a series of weigh stations along the I-75 corridor from Florida to Toronto, Canada. The I-80 program is in the concept stage, and will build on earlier experience so that we can begin a true, nationwide link of CVO projects at an early date.
- The most difficult barrier for IVHS\CVO is not technology, but what we call "institutional" barriers -- the many states and agencies within states who currently insist on doing things only their way. Already, the ongoing CVO demonstration and research projects are putting chinks in these state walls, and unrelenting Federal leadership and funding support will be needed to be sure these walls come down sooner than later.

- While we enthusiastically believe in the potential of IVHS\CVO, we must sound caution that the new technology can create difficulties for fleet operators. We want to be sure that CVO is not used as a tool to promote and enforce new truck taxes, and that the rapid development of this technology does not lead to duplication and confusion about the kinds of equipment truck operators will need to purchase and use.
- In addition to CVO activities, truck fleet operators are also interested in other IVHS applications, which can yield many other efficiencies and productivity benefits. These include Automated Traffic Information Systems (ATIS), Automated Traffic Management Systems (ATMS) and collision avoidance systems. Anything that reduces congestion and delay benefits our operators.

Here are some more thoughts on the points raised above:

IVHS America. I want to put in a plug for IVHS America. This unique Federal\public sector\private sector partnership has already yielded many benefits for trucking. Congratulations to the staff of the Federal Highway Administration and the Office of Motor Carriers who have listened well through the CVO Technical Committee of IVHS America, and developed a program responsive to our needs. This responsiveness is a model of federal\private sector cooperation. Thank you, too, Mr. Chairman, for the strong support of your Committee and Congress for IVHS\CVO activities.

National Commercial Vehicle Network. At this meeting of IVHS America, the CVO Technical Committee has met to review and assist an exciting Federal initiative -- a **National Commercial Vehicle Network**. As set out in a concept paper on IVHS developed by the Department of Transportation, the ongoing Crescent\Help, Advantage I-75 and the new I-80 demonstration projects can be linked, and to quote DOT ...

> "By automating these corridors and encouraging expansion of IVHS technologies on other interstates, a fully automated network that will allow trucks to move as freely as cars could become a reality by 1998."

This network would be built around several important "service areas" including safety, credential and reporting processes, size and weight screening, hazardous material monitoring and response, fleet management, and cross-border truck transportation.

We urge that your Committee, and other IVHS program authorizing and appropriations committees focus on and adopt this National Commercial Vehicle Network concept. The vision is clear and simple. If we all keep it in mind, the rest of the pieces of the puzzle will quickly fall more neatly into place.

CVO Demonstration Projects. I serve on the Policy Committee of the Advantage I-75 Project. This project is setting a remarkable standard for Federal\State\private sector cooperation. The special leadership of Calvin Grayson, Kentucky Transportation Center, Don

Hartmann, Project director, and Don Kelly, Kentucky Transportation Cabinet has and is making this project happen. Advantage I-75 is building well on the lessons learned in the Crescent\Help experience, and is setting the stage for even more progress in the Interstate 80 corridor. Three years ago the commercial motor fleet community was very skeptical about the prospect of six states and a Canadian Province actually agreeing to recognize another state\provincial clearance and set of credentials. Now it's happening! Not all the bugs have been worked out, and the concept is a long way from meeting its full potential. But it's on the way, and there is no turning back.

These ongoing projects would not have been conceived and grown without Congressional vision and support, Department of Transportation leadership and funding, and the good will of the participants. We urge you to continue financial support and vision for these projects while the National Commercial Vehicle Network is put into place. With concentrated attention and adequate funding, we're going to realize "early winners", and deployment, rather than just "demonstration", will be just around the corner.

Institutional Barriers. There is no question that there are many state to state (and even agency to agency within states) barriers yet to cross. Attachment 1, drawn from a recent technical paper commissioned by the Federal Highway Commission, illustrates the complexity of just one of many processes relating to commercial vehicle licensing and registration. Taken as a whole, they seem overwhelming. So strong, unrelenting federal leadership will be needed to develop a simpler national database and communications system to support a nationwide network.

This is more than doable. Think about how bankcards can now be read in automated teller machines (ATMs) not only across town, but across the country and overseas. In the last year I have used mine in Bethesda, Maryland; Alexandria, Virginia; Portland, Oregon; and Paris, France. Is motor vehicle credentialling more complicated? Even the Internal Revenue Service has become more customer friendly, and it is possible to file a tax return electronically. I've attached an early draft of a concept (Attachment 2) that will help you visualize how this might be done. I am certain that the states themselves will save money and become much more efficient when this network is in place. Let's all stick together to make it happen, soon!

Potential Hazards for Commercial Vehicle Operators. Please don't mistake our excitement about IVHS\CVO with blanket endorsement of all proposed uses or approaches to CVO. In many respects, the accelerated funding for IVHS has led to a large number of solutions (products) without a problem (a real market need). We should carefully focus on the concepts outlined above to skirt the waste and "pork" that could be associated with any large new Federal funding initiative. We should also avoid activities in areas where the competitive business environment has already moved, such as "fleet management" technology, including satellite tracking, and mobile communications.

Also, we want to stress that participation in the National Commercial Vehicle network will happen much quicker if it is **voluntary**, not mandatory. The system itself will yield so many benefits to safe and productive fleets that it will be easily justified and well accepted. It will also allow the Federal Highway Administration and state agencies to focus on those fleet operators who are less safe and less likely to comply with safety, tax, and registration requirements. On a cautionary note, though, we don't want to see IVHS\CVO become a tool for unwarranted and accelerated enforcement activities where these are not warranted. NPTC believes this danger can be offset through cooperative efforts with enforcement officials.

Yes, IVHS\CVO will also give many states an excuse to implement and innovate new and onerous "third-tier" taxes (those other than fuel tax and registration systems. We'll have to deal with those on their merits. We oppose such third tier taxes and will work to be sure the efficiencies of uniform, single-state record keeping will improve the overall quality and scope of current, legitimate truck-taxing systems.

And, we are concerned about the "standards and protocols" issue. As an ideal, we want to be sure our members can use one device to serve all IVHS uses, whether these relate to CVO, toll collection or traffic monitoring and control. This requires early and constant attention within IVHS America, and the Society of Automotive Engineers and other standard-setting bodies.

Universal Application. We want to be sure that IVHS\CVO benefits trucking activities, nationwide. Relatively, a small portion of the total truck population will travel significant portions of the nationwide network. Most will work within a 200 mile radius, and not travel the interstates. We see benefits for these operations as well, including the uniform national data base and communications system, traffic congestion information, and toll collection devices. Please keep these fleets in focus as you consider the more dramatic applications for longer-haul fleets.

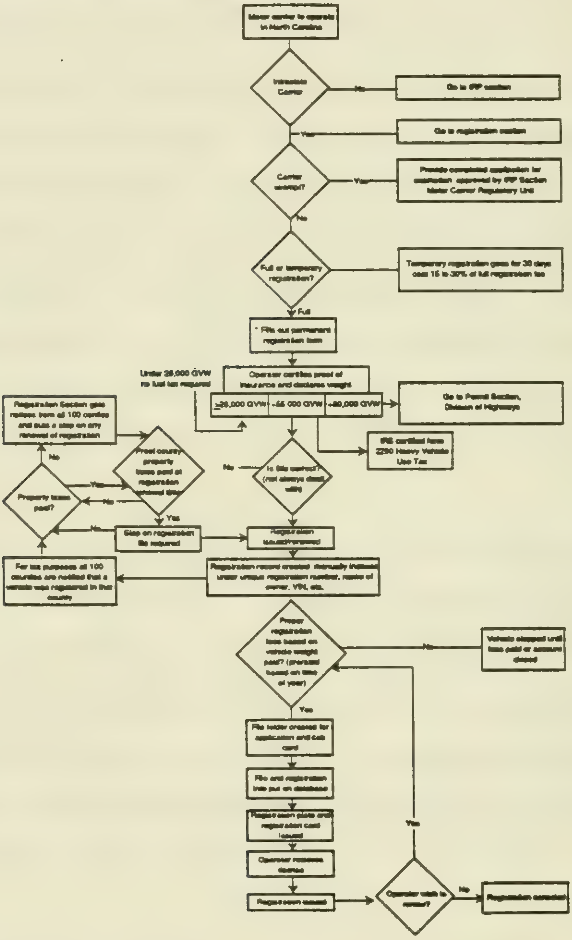
CONCLUSION

Mr. Chairman, the National Private Truck Council appreciates your subcommittee's focus on this vital new world for commercial vehicle operations. We urge you support and promote a Nationwide Commercial Vehicle Network, continue vigorous funding of the demonstration projects that will allow the network to reach deployment stage, encourage development of a national database and communications to support the network, and be wary of proposals and programs that will cause us to lose focus on this goal, or which will not solve a real problem.

We appreciate this opportunity to testify, and will be happy to respond to any questions you may have.

DRAFT

Figure 2.7 Example of the Intrastate Motor Carrier Registration Procedure: North Carolina


Motor carrier to operate in North Carolina
Intrastate Carrier
No
Go to IRP section
Yes
Go to registration section
Carrier exempt?
Yes
Provide completed application for exemption approved by IRP Section Motor Carrier Regulatory Unit
No
Full or temporary registration?
Temporary registration goes for 30 days cost 15 to 30% of full registration fee
Full
* Fills out permanent registration form
Under 26,000 GVW no fuel tax required
Operator certifies proof of insurance and declares weight
≥26,000 GVW
<55,000 GVW
>80,000 GVW
Go to Permit Section, Division of Highways
IRS certified form 2290 Heavy Vehicle Use Tax
Registration Section gets notices from all 100 counties and puts a stop on any renewal of registration
No
Proof county property taxes paid at registration renewal time
Yes
No
Property taxes paid?
Yes
No
Is title correct? (not always dealt with)
No
Stop on registration file required
Registration issued/renewed
Registration record created manually indexed under unique registration number, name of owner, VIN, etc.
For tax purposes all 100 counties are notified that a vehicle was registered in that county
Proper registration fees based on vehicle weight paid? (prorated based on time of year)
No
Vehicle stopped until fees paid or amount cleared
Yes
File folder created for application and cab card
File and registration info put on database
Registration plate and registration card issued
Operator receives license
Registration issued
Operator wish to renew?
Yes
No
Registration canceled

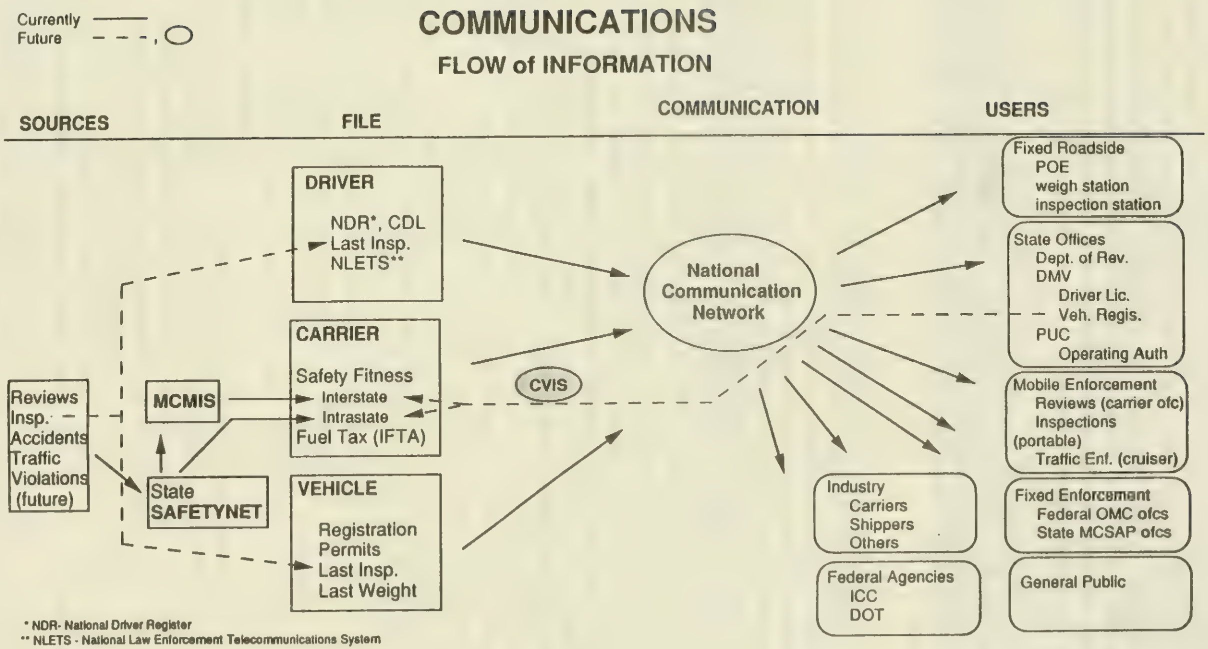
* Ensures carrier has everything needed - lot of discussion

Source: Cambridge Systematics, Inc., from interviews and materials provided by the State of North Carolina, November 1992

ATTACHMENT 2

COMMUNICATIONS

FLOW of INFORMATION



* NDR- National Driver Register

** NLETS - National Law Enforcement Telecommunications System

GENE BERGOFFEN, CAE

Gene Bergoffen is Executive Vice President of the National Private Truck Council, a national trade association which represents 1600 members, including nearly 1300 companies who operate the private truck fleets which help feed, fuel, and provide vital products and services to the nation.

Gene has previously served a number of trade and professional associations, including the American Bar Association, the National Forest Products Association, and the National Association of Chain Drug Stores. His career experience also includes several years as Director of Legislative Affairs for the Forest Service, U.S. Department of Agriculture.

His training includes an undergraduate degree in forestry, and a masters degree in public administration, both from Syracuse University. He also has a bachelor of laws degree granted by Georgetown University.

Gene serves on the Secretary of Transportation's Motor Carrier Advisory Committee, on the Policy Committee of the Highway Users Federation for Safety and Mobility (HUFSAM), on the Board of Directors of the Intelligent Vehicle Highway Systems of America (IVHS), and on the Policy Committee of Advantage I-75.

He is a member of the American Society of Association Executives (ASAE), the Society of American Foresters, a member of the District of Columbia Bar, and is a Certified Association Executive, a professional designation granted by ASAE.

Gene and his wife Sue have contributed several daughters to our society, and live in Bethesda, Maryland.

Mr. Carr. Thank you, Mr. Bergoffen. If you were here earlier when I talked about appropriate technology, then I think we are on the same wave length here. It is very important that we assure the taxpayers that we are not funding dazzling and interesting things that really are not directed toward a problem. We simply don't have the resources to do that. And I am glad to hear from you, Mr. Kelly, about the dimensions of the rural needs in all of this.

Sometimes we have a tendency to overlook the safety implications of higher speed operations. And Mr. Kassoff, to learn about the Northeast corridor from a highway perspective is welcome. In this Committee we hear a lot about the Northeast corridor and it has come to mean rail, which means needs to be supported, and I am sure this committee will support it.

IVHS IMPACT ON CONGESTION

Mr. Carr. I am going to lead off with a question to Mr. Grubba and we did not rehearse this, but I have to say that in my position I am privileged to meet and hear from an enormous number of people from all over the country who know a lot about transportation. I think all too often we have a tendency to think about expertise as proportional to how far it is away from our own home. I am delighted to say that in John Grubba it is an inverse proportion. I frequently learn more from John Grubba than I do the further away I go.

Just this morning we had a press event over here to introduce the hearing, and Mr. Grubba was there and he took a question from a Washington journalist who posed the question, I am sure not himself, but that others have made, but, won't IVHS draw more people to the highways and create more congestion? And Mr. Grubba gave what I thought was one of the more eloquent responses to what transportation is all about, not just IVHS. And I wonder if you could run that tape recorder back, John, and—John actually got a little feisty at the notion that IVHS was going to cause congestion and gave an answer that I think ought to be put on the record. That is why I am asking it again.

Mr. Grubba. Thank you, Mr. Chairman. And it certainly is flattering, your remarks, and I hope I can remember what I said. Maybe it was on tape.

As I recall the question and as you pointed it out, was IVHS, will it create more congestion because it will make surface travel on the roads easier, safer and will sort of encourage more congestion. And I think the response with something like congestion is not a conversation about vehicles. Congestion is a conversation and traffic is a conversation about human activity. And as a matter of fact businesses, downtowns, universities, are products of congestion. This whole meeting is a congestion.

The question is not get rid of congestion, but provide mobility in congested areas. Human activity, a trip, I think, is an economic transaction. Each trip is an economic transaction. If that is too millionairistic, at least an economic and social transaction. To be human is to be mobile and we have been, you know, sprawling since the Garden of Eden and when we look at the stars, we can see that humanity has not yet begun to sprawl.

Mobility is basic to being human. The transportation system must encourage the use of it for mobility of individuals so that they can fulfill their potential. We should not be designing a system or surface transportation system that has as its goal the limitation of economic transactions. It seems to me that the system is all about improving the system so that more economic transactions, social transactions, can take place. And we have to concentrate on and change our thinking, I believe, from looking at congestion as something about vehicles and see the transportation system as encouraging human activity and opening new lines of human potential.

I think I said something like that.

ADEQUATE EVALUATIONS

Mr. CARR. It was very good. In regards to Oakland County's experience, and this is something that I have been pretty insistent upon in terms of my support for the project so that I have credibility with my Committee Members, I would like you to expand on the evaluation aspect. Listening to Dr. Horan earlier and the need of this Committee for information, indeed the need of society in general for information about what it is we are doing and are we being appropriate in our investments. So you do have a connection, an academic connection with the program and I would like you to talk on the record a little bit about that.

Mr. GRUBBA. The Department of Transportation and Federal Highway Administration is very insistent on full evaluation of all aspects of our project. The University of Michigan is the prime contractor doing evaluation of our project. The University of Michigan is specifically working on evaluation of the driver information element, the Ali-Scout element. Michigan State University is subcontracting with the University of Michigan.

Can you see how FAST-TRAC—it is traditional rivals even, it is amazing. And they are doing evaluation of the SCATS, the traffic control element of the system. We have preliminary evaluation from MSU that shows that the corridors in which SCATS is located reduction in travel time from 4 percent in offpeak hours to 11 percent reduction in peak hours. They have done preliminary evaluations on reduction of traffic accidents at the SCATS-controlled intersections, and while they are not satisfied that their findings are now scientifically valid, the preliminary indications are that specific accidents at the controls intersections are substantially reduced.

As I said, they don't want me to say that because they are not satisfied that their findings are scientifically valid yet.

They will be reporting to the project committee within the next couple of months on their preliminary evaluations. But as I said, FHWA has overseen the evaluation. The Federal Highway Administration has a very rigorous evaluation protocol for these tests to follow. And the universities, of course, are absolutely adamant that their findings be valid from their point of view.

Mr. CARR. In other words, the project is designed so that it contributes to the body of knowledge about——

Mr. GRUBBA. Yes, very much so.

ADEQUATE DATA COLLECTION

Mr. Carr. One of the things that this Committee has been working on in the past few months is to try to figure out a way to develop criteria where we can make better investment decisions about which projects to finance, given an environment of scarce dollars. We have done a tremendous amount of work, the committee and the staff, in trying to develop criteria so that if individual Members of Congress or individual mayors or governors come to us and ask us for a particular road, a particular bridge, an IVHS system, we will be able to ask some questions that will give us data. This will enable us to make an investment decision rather than a political doling-of-dollars decision.

One of the things that we have found from our early foray into this area is that the available data on which to make and build a decision is relatively sparse in the surface transportation world. We do have, fortunately, a fairly significant amount of data in the aviation world where radar returns can be digitized and thrown a tape, where every tenth ticket is essentially lifted and sent to the U.S. DOT so that we can analyze where people are and where they want to be.

There is some work being done in Federal maritime; the Office of Intermodalism is doing a complete study on freight movements in America. But we don't find that at the highway level. We have a lot of data about highway conditions. FHWA with their HMMS system has huge databases about whether a road is about to fall apart or not, but we don't have very much information—and—you know, what is the word? Axle equivalent. Equivalent axle loading or snag, they use, so that we know a little bit about weight and movement across a particular piece of highway.

We don't know a lot about where that vehicle started from and where that vehicle is going. And, of course, this runs into an enormous privacy issue, not so much, I suppose, with your members, Mr. Bergoffen, but if we try to analyze where people are and where they want to go then we get too intrusive about it. When one spouse comes home and says they were late because they went to the grocery store and the other spouse says, no, you didn't, you can get into some serious problems as a society. We don't want to be too intrusive, but we want to think more about where people are and where they want to be. IVHS has the potential to helping us out with this data collection, and I think at its inception with your members, Mr. Bergoffen, you cite what you can receive from IVHS in terms of greater throughput, such as not having to stop at weigh stations, more coordination. And you, I think, correctly pointed out that a lot of this has to be and probably should be in the private sector, not in the public sector, but at some point the public sector needs to know what is going on, needs to enforce some standardization, needs to say your tax for doing this is not necessarily just money, but it is also information.

We want motor vehicles to be more than platforms of mobility. We want motor vehicles to be platforms of information, both to those inside the vehicles, perhaps, but also those who have to make decisions about the investment consequences about what those vehicles are doing.

So is IVHS America working on this particular interface; this information interface? People don't want to be told what to do. On the other hand, we, as decision makers need to have some data so we may need to tell you what kind of data to collect or how to do it. Are you discussing this at IVHS America?

Mr. BERGOFFEN. Definitely with respect to commercial vehicle operations. There are current data collection activities. There is the trucking industry use survey that is done by the Bureau of Census currently. But that could be automated or bar coded or otherwise identify their freight on an electronic bill of lading. We are looking at ways to identify hazardous material on cargo that could be identified remotely if there were an incident of those kinds of things. I think that is a price that as long as there is an election and a place that doesn't divulge the individual business entity and that you could contribute to such a, thank you, we need to know that information, as well, it helps us do business better. It helps us be more efficient, but what we need is a leadership to create this system. Like the little chart that I put on my statement, something is going to have to sit down and say we need 200 or 300 pieces of data.

The technology is in the background, but this is what we want. The technology is there to do it, but we are going to have to bring the various players together. That is one of the neat offshoots of this exercise. Because we are focusing on information technology, the players are being drawn together. They see the benefits and they have crossed the barriers that they have across States.

I have rambled a little bit, but we want to participate and be careful not to give away private stuff that another competitor can get, but that can be done very easily.

Mr. CARR. Thank you.

Mr. Delay.

FUNDING PRIORITIES

Mr. DELAY. Thank you, Mr. Chairman, and I apologize for having to step out. I was away participating in a local radio talk show. So I apologize to you, Mr. Chairman, and to the former panel for missing half of their testimony. I will be reading your testimonies and I appreciate y'all being here. The questions that I have, Mr. Chairman, may not apply to this panel, but since we do have a Secretary of Transportation, we have an administrator to the Department of Transportation, maybe you can answer it since you have to it.

As you probably know, maybe you don't know, the City of Houston has, one of the largest IVHS programs in the Nation. I am from Houston and very proud that it is a major part of an overall mobility system that is being constructed that will enhance overall mobility well into the next century for the city of Houston. I just wanted to ask your opinion regarding the best use of IVHS dollars.

Is it in assisting transit or in relieving congestion on the highways? These systems in many ways accomplish the same goals, but act in very different ways. Are there any stated priorities? What I am getting at is most of this money, as you well know, comes from Federal highway aid money and from the FHWA. For example.

Houston Metro, our mass transit authority, has received Section 3 new start money that is going—maybe not directly into IVHS, but into a flexible system that we have in Houston. We are moving money across all kinds of lines and showing that different authorities can work together and accomplish some great things. However, the FTA doesn't particularly participate in IVHS maybe because it is called IVHS, highway systems. How do you feel about that? Are there stated priorities? Should there be monies moved back and forth? Should there be more monies coming out of FTA for intelligent vehicles?

Mr. KASSOFF. Within our department our Mass Transit Administration has implemented a technology which is a vehicle locator system, a fleet management type of operation, and they have had great success with it using the Westinghouse Corporation technology, and I think there is clearly application in the transit industry. Most transit is still on rubber tire using the highway system so you have a built in stake for highway agencies and transit agencies to work together, and as a highway administrator we want our systems to be operational. So we encourage as much transit as possible.

Another program, the Chart Program, our local IVHS program, it is low tech. It is something that constituents, customers and travelers are demanding, and that is incident management; clearing the roads quickly.

First of all, learning about incidents quickly and secondly police and transportation facilities, transportation organizations, working together as teams to clear the Capital Beltways and I–95s more quickly than we used to in the past. These are not glamorous areas of technology, but these are customer-driven. They are things that are built on cooperation and team work which are human factor side, rather than technological elements of the system. But I think the Congress needs to be supporting those things as foundations so that we can then move technology, building on a foundation of priority work that can be done very, very quickly.

Mr. DELAY. The monies that your mass transit system is using—are those local funds or Federal funds tht come from FTA?

Mr. KASSOFF. Federal and local in combination.

Mr. KELLY. One unique thing about IVHS America is the partnership and all of them are active in IVHS America. And really the key to it is not saying that any one thing is particularly good. It depends on the area. Houston may have one desire and Louisville, Kentucky, another. But the main things are the safety and mobility. We now have more vehicles than we have licensed drivers in this country and that continues to increase. I don't know how that works, but it is a true fact. And the other side of that is we can't possibly move all of those in the ways they want to move, and so as a result we have to have tradeoffs and that involves the transfer of monies, the ability to move monies into transit over rail or whatever it might be as opposed to highways. In Kentucky we have difficulty building all the roads that need to be built, so we are setting priorities through the local metropolitan planning organizations. Let's work together to make it work. It is a partnership.

Mr. GRUBBA. And specifically IVHS America has over the last year developed a strategic plan for the research and development and deployment of IVHS elements. It has a highway element, advanced public transit system element, FTA does have several projects under way financed by them on operational tests. I think your Committee has received copies of that plan.

It was submitted also to the U.S. Department of Transportation. IVHS America is a designated advisory agency to the Department of Transportation and the department did ask the IVHS America to develop that plan. It does specifically set forth priorities for funding and testing and the advanced public transit element is quite significant in the plan.

EARMARKING PROJECTS

Mr. DeLay. One of the things that concerns me yet, excites me, is the amount of money that is proposed to be put into IVHS by this Committee. I am very supportive of it, because I am a supporter of IVHS and I think it is the future of mobility. But last year the Subcommittee funded $113 million from Federal aid programs for IVHS and an additional $30 million from the budget request. This funding obviously shows a strong support by this Committee for IVHS.

But my question regarding how this money is spent involves this Subcommittee. Since I have been a member, it has chosen which city and/or which geographical area receives this funding.

Do you all believe this is the most efficient use of these funds or should there be some kind of criteria or possibly a matching process, particularly for these funds?

Mr. Kelly. Mr. DeLay and Mr. Chairman, I guess I have strong feelings regarding demonstration projects and I think that is what you are alluding to. There are many viable projects, IVHS projects across the United States and I am involved in a couple of them very actively and to see our project be underfunded and see dollars go to a project that wasn't in the priorities is somewhat disconcerting and of concern to me.

I guess I have a little bit of a problem with demonstration projects, and the point is you don't have the information to make the decision and I think more information and input should come from IVHS America in this process where we have so many different agencies. We have got all of the Federal, State, local government agencies, academia, the private sector as well as the major Federal agencies. So I think that the process we have developed to set priorities is excellent and that more attention needs to be paid to that in this process.

Mr. Bergoffen. On that point I would like to offer in IVHS America in our tactical planning process we have identified a series of user services to begin to pull together what it is we are really trying to achieve and see how these user services relate.

I mentioned a few of those in the commercial vehicle area, but they also relate to traffic information systems and so on, so we don't want to look at it in tunnel vision or in functional silos. From a shipper's point of view, whom I really represent, they just want to get the goods there by whatever means and we need to look at the same flow. I offer that IVHS America will give you the background on this new service area concept, user service concept and help you in your priority process.

Mr. DeLay. Mr. Kassoff.

Mr. Kassoff. I was going to comment on how well I think the operational test program went with the applications going into the Federal Highway Administration and technical evaluations based upon what could be learned on a national basis. We submitted a number. We didn't get all that we applied for, but we felt there was a fair hearing. I think the idea of structuring the designated funding within IVHS for operational tests and then use of individual State programs for deployment makes sense.

There is a unique issue involving multi-State corridors. In our judgment, over 90 percent of the investment in IVHS in the Northeast corridor and similar multi-State corridors around the country will come from intrastate, individual State, individual toll authority investments.

An issue to focus is the remaining 5 to 10 percent that might be required to connect all of the elements together, that no individual State either politically or technically would be as inclined to front end, but where there is a clear national interest involved in terms of interstate corridors, and that might be a second area where deployment might make sense within the designated IVHS funding area.

But other than that, I think the basic structure of demonstration through technological competition, fair playing field, and then deployment out of your normal program which then pits it against the priority setting process, capital intensive versus traffic management intensive, is a healthy way to go.

Mr. DeLay. Well, that sounds very good, but I got to tell you even with the great leadership of our Chairman, who has shown tremendous leadership, I must say in trying to come up with criteria by which this Committee makes their decisions on particular projects, I don't think the rest of the House is going to allow this Committee to do it that way, unfortunately.

So I am looking forward to working with IVHS America to come up with some sort of guidelines that still allows certain Members to take credit for the projects and still brings some sort of meaningfulness to how we deploy this money.

We are talking about some significant increases in funding for IVHS and it worries me that we are going to get into projects that right now are, for lack of a better word, embarrassing the Appropriations Committee for having participated in them.

Along those lines, to your knowledge, and because of the earmark process, has the committee funded any red herrings to date? Maybe you can give me an example after the hearing. I don't want to put you on the spot, but it gives you an idea by squirming—I saw all four of you squirming a little bit—the kind of squirming that we have to do in the same sort of process.

We are looking forward to working with you in the future and particularly with the leadership of this chairman, I think you are going to find monies are going to be spent better and more efficiently than in the past.

Mr. Kassoff. I would like to add a comment that demonstration projects in the capital area, the highway construction area are a fact of life. Many State transportation agencies on the one hand have complained about that as distorting the priority setting process. On the other hand, you don't dare not compete so you are kind of in an awkward situation.

I would urge that if there is to be demonstration projects in the IVHS area similar to the demonstration projects in the highway construction area that they not come out of the IVHS fund, which is to truly demonstrate through technological merit and truly educate.

You heard testimony this morning about this being an international race and I think the funding for operational tests really needs to be on the merit, technological merit, and then if there are special projects, that they be funded separately. That would be the only guidance I have to offer.

Mr. DeLay. Well put.

Thank you, Mr. Chairman.

CRITERIA BASED ON DATA

Mr. Carr. Well, thank you, Mr. DeLay. We are, as I pointed out, trying to do a better job and to establish criteria. I might point out, though, that we are all somewhat vulnerable to politics and we are not going to take the politics out of politics. Highway administrators across the country don't like demonstration projects because they know better than we know better, and we know better than they know better and we get into that kind of thing.

Hopefully, we can remove it from that environment, talking about criteria based on data. We may differ on the criteria and we may differ on the meaning of the data, but at least then we are debating on real world measurements. We are not debating about whose value is higher than someone else's value, which no one can ever prove or even debate.

I must say, and this may seem impolite because we have had the wonderful hospitality of IVHS America here today, but we weren't born yesterday either and we know that IVHS America is not only a wonderful way to improve and channel communication about IVHS, but it has also its own internal political system where you compete to get on committees and compete to get named chairman; and compete to have their part of the private sector or their part of the world recognized inside of IVHS America's own priorities.

And so for some of us to say, well, we are political and you are not, so why don't you tell us what to do and that has a better priority, that isn't going to work either.

And just to make the point, let me read from IVHS America's October 15, 1992, recommendations for the Federal IVHS program. I don't mean to pick on you, Mr. Kelly, and I am not saying you were the author of this, but you did bring up rural in this whole environment.

So I am reading here from the research and development advanced rural transportation systems and there is a priority ranking here, and number six is, "Rural Safety, warning of animals on or near the roadway."

And then it goes on to describe,"Explore alternative technologies for warning drivers of livestock or wildlife on or near the road. Example, heat sensors or radar." And then it says, "or explore warning of animals of approaching vehicles through light, sound, or other devices as an alternative approach to the problem."

Well, you know what happened, it is called the "Lawrence Welk phenomenon" in Congress right now because someone dug deep inside the fine print of an agriculture appropriations bill, and found that there was money going to a spot in the Dakotas that had something to do with Lawrence Welk's birthplace. And, of course, it became national news overnight.

If you live in the rural areas and I have constituents who hit deer and really mess up their cars and road kill can be called a national problem, I suppose, but the fact of the matter is the news media would take this and use it to say that we can't count on this being good prioritization of hard-earned public dollars.

So I am grateful for IVHS America and I want to—Mr. Kelly is itching to respond here, but I will let you in a minute—but the fact of the matter is you can't take the politics out of politics and I think what we all need to do is have a respect for each other as trying to do the best thing based on something we can measure.

That is my point. Let's try to get something we can measure. And the neat thing about IVHS, it seems to me, that inherent in information technology is our ability to measure things. We can argue about the meaning of the measurements, but at least our debate is on that as opposed to is rural America getting enough or is urban America getting slighted or is my part of the world not loved the way your part of the world is loved, things like that. Hopefully, we can elevate the debate by putting it on a measurable basis.

Mr. Kelly.

Mr. Kelly. The measurable basis you ask about, your home State of Michigan had 66,000 vehicle/deer accidents last year. My home State of Kentucky had about 3,500. So while there may not be a good answer to that, and I apologize for that statement in there, it is still a serious problem in the rural areas.

Mr. Carr. Mr. Kassoff.

Mr. Kassoff. I would like to comment on a point which really builds on a point you made earlier about solutions chasing problems and technological gadgetry. I admit there is a very real danger of the kind you just described if we bypass some of the basics particularly. There are basic opportunities being—I alluded to incident mismanagement being one of them. The whole domain of IVHS is being dominated by high tech and that is good and everybody is looking for applications for defense technology.

But there is a side to this that is very basic like, as I said, just getting a front end loader to move an overturned tractor trailer off the road and getting the police and transportation people to talk to one another, getting different highway organizations to communicate. Since the I–95 Corridor Coalition was developed we discovered the telephone and the fax and with that technology have actually communicated up and down the corridor for the past 12 months without any grant money from anyone and we are paying our own phone bills, but it is amazing the improvement.

When there have been incidents on the Delaware Memorial Bridge, just as an example, that have blocked traffic temporarily, for the first time in our history since George Washington crossed it, folks all the way down from Massachusetts down to Maryland are learning about it and now through the public media such as Metro traffic on the commercial radio and through variable message signs are able to convey that information.

I guess the point is there are priorities that I think we can all agree upon that we can get started on right away and they are sort of common sense things that everybody would agree to do, and I hope we can all kind of focus on those, and I couldn't agree with you more when you get into some more exotic areas, I personally believe, and I don't mean this in a patronizing way, that fresh air from the public policy makers and elected officials is what is needed to make sure we are not devising technological solutions that are chasing problems.

Mr. DeLay. Mr. Chairman. Because you said it, Mr. Kassoff, in this using common sense in the case of deer being hit and it is a real problem, I am not minimizing the problem. We hit them all the time in Texas, too, but common sense might dictate to look at the deer population and opening the season longer might be an answer to that rather than build a deer bridge.

I can remember—I can't remember exactly, there was a deer bridge about seven, eight, 10 years ago that caught the national media where they built, either it was for tigers or deer or something. Anyway, they built this bridge for deer to cross and no one could get the deer to use the bridge. And that is the kind of thing I think the chairman is trying to avoid.

Closing Remarks

Mr. Carr. Well, unless there are any further questions, we thank you for your time and attention. All of you and all of IVHS America have done a great job of educating this particular Member of Congress, the Committee Members and the staff. It is an area that we are going to be involved in for many, many years to come and hopefully we will have a very productive partnership in trying to do something good for our country.

Thank you very much. The hearing is adjourned.

[Additional prepared statements and Mr. Wolf's questions and responses follow:]

TESTIMONY OF LESTER P. LAMM

PRESIDENT, HIGHWAY USERS FEDERATION
BEFORE THE HOUSE TRANSPORTATION APPROPRIATIONS SUBCOMMITTEE
APRIL 15, 1993

I want to thank the chairman for holding this hearing, and for giving the Federation the opportunity to submit this testimony for the subcommittee's hearing record. Intelligent vehicle highway systems are a critical element of America's efforts to ease urban congestion, lessen pollution and promote highway safety, and supporting such systems is a critical investment in our nation's future.

In addition to being president of the Highway Users Federation, I serve as unsalaried president of the Intelligent Vehicle Highway Society of America, a public/private sector partnership established three years ago to coordinate activities in developing intelligent vehicle highway systems in the United States. Your committee had earlier pointed out the need for an overall IVHS coordinating mechanism, and we believe IVHS America is filling that need.

We have also been very active during the past 14 months, working to help the U.S. Department of Transportation implement the intelligent vehicle highway system provision of the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). That landmark legislation authorized $660 million in federal support for IVHS research and testing. That will be money well spent. The new jobs and greater productivity IVHS creates will be worth many times this initial investment.

IVHS is more than simply a research program for transportation engineers and planners. IVHS means jobs and marketable technology development today, and it has the potential to be a key part of our economic growth and productivity in the future.

Intelligent vehicle highway systems use computers, communications and electronic technology to help solve multiple surface transportation problems. Wide-scale use of IVHS would be a boon to those industries that produce its components.

But more important than the gains in job growth and economic expansion would be the positive changes IVHS brings to our nation's roadway networks. Deployment of IVHS would mean less congestion, improved safety, increased economic efficiency and a cleaner environment. Studies indicate that by the end of the next decade, operating IVHS routes can reduce traffic fatalities by 8 percent, and traffic congestion by 20 percent.

The best part of IVHS development is that it relies minimally on government support, instead receiving most of its financial backing from the private sector. IVHS America has projected a 20-year, $209 billion program in which 80 percent of the funding comes through private sector investment. Such a commitment will enable the United States to remain the leader in worldwide IVHS development, creating new jobs, new electronic technologies and a new international marketplace.

And the winners from IVHS technology development extend far beyond automobile manufacturers. Manufacturers of hand-held devices that provide a variety of traveler information such as bus schedules, directories of business listings and tourists attractions also stand to gain. The American Automobile Association is already producing traveler information kiosks to be displayed at airports, hotel lobbies and visitor information centers. A Los Angeles-based company called Pactel TeleTrac uses IVHS technology for fleet management purposes.

Consumers, too, are excited about the future availability of other IVHS technologies. In Orlando, the year-long TravTek project, which provides in-vehicle navigation and dynamic route guidance in 75 rental Oldsmobiles, is winding down. Preliminary findings show that users were enthusiastic about the technology and its benefits, and look forward to its availability on the market. Asked to rate TravTek on a scale of one (poor) to six (excellent), the average user gave it a 5.1.

IVHS technology is already in wide-scale use in other countries. In Japan, more than 300,000 in-vehicle navigation systems have been sold in high-end vehicles, and every major car company has offered some version of navigation systems as part of their on-board entertainment consoles.

Fulfilling IVHS infrastructure needs will also create a large market. These needs include sensors and actuators, beacons, and hardware and software for electronic toll collection and area-wide traffic management systems. For instance, the FAST-TRAC IVHS operational test, based in Oakland County, Michigan, uses a computer-based traffic signal control system known as SCATS, and Autoscope video image processing system to monitor intersections, and a system of roadside beacons used for dynamic route guidance manufactured by the Siemens Corporation.

In fiscal year 1993, FAST-TRAC will equip 95 intersections with SCATS and Autoscope technology, and install 30 of the beacons produced by Siemens. Electronic tolls have already been deployed in many areas, with competitive bidding among several companies to develop and manage the systems. Other IVHS technologies in this area include weigh-in-motion and automatic vehicle identification for long-haul trucking.

IVHS America is also providing some help with our national defense conversion effort. As defense contractors face reduced demand for new weapons systems, many are becoming part of the transportation industry as a way to find new markets for their expertise. Companies such as Westinghouse, Raytheon, Lockheed, Rockwell and Harris have all become active members of IVHS America in the expectation that intelligent vehicle highway systems will provide a whole new market for their technology and products.

Despite this progress, I would caution that the relative size of the defense contraction and the entire IVHS effort limits the extent to which the shift offsets more than a small percentage of prior federal defense spending. Clearly, IVHS is no panacea.

Yet even with the private sector involvement I've mentioned, IVHS does need government support to realize its full potential. Because state and local governments actually manage traffic and build, operate and maintain surface transportation systems, those entities must demonstrate their commitment to IVHS. They will install, operate and maintain the IVHS infrastructure, or contract out these functions to the private sector. IVHS success will require the active participation of state and local governments to succeed.

And executing IVHS programs does require federal assistance. With full funding of ISTEA, we can be assured that IVHS is funded, creating jobs and promoting economic growth in the high-technology industries.

In addition to expanding economic growth, creating jobs, lessening congestion and improving safety, IVHS will also enhance, rather than restrict, America's freedom of mobility on highways. It will help Americans retain and expand their freedom of travel, which we as a country value so much.

As important as freedom of mobility, Mr. Chairman, will be the increased travel efficiency brought about by application of IVHS technology, a potential benefit that we haven't fully appreciated.

Americans are increasingly faced with the responsibility of having to accomplish more in less time. Time is money in our society. Once you start pricing your time, and realize the lost productivity resulting from sitting in traffic on congested highways, you realize that taking steps to use intelligent vehicle highway system technology pays rich dividends far beyond the amount of money we spend on researching and developing it.

So, Mr. Chairman and members of the committee, I hope I have been able to articulate for you why spending funds on IVHS research is more than just a short-term proposition. It is truly an investment in America's transportation future that will give us a return on our money far greater than the amount we spend. IVHS will create jobs, help to grow the economy, contribute to efficiency and save lives. Those are all goals that I hope you will support.

Thank you for the opportunity to address the committee.

IBTTA

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May 5, 1993

Representative Bob Carr, Chairman
Transportation and Related Agencies Subcommittee
of the House Appropriations Committee
U.S. House of Representatives
2358 Rayburn House Office Building
Washington, D.C. 20515

Dear Representative Carr:

The International Bridge, Tunnel and Turnpike Association (IBTTA), representing 300 toll facilities worldwide, asks you to submit our written statement for the record following the IVHS Field Hearing held April 15.

IBTTA welcomed the questions you and Representative Frank Wolf, Subcommittee Ranking Minority Member, raised during the hearing on operational Intelligent Vehicle Highway Systems (IVHS) applications, especially current electronic toll collection uses.

Electronic Toll and Traffic Management (ETTM) allows the toll industry to electronically collect tolls in the accurate, efficient and cost-effective manner desired by the motoring public. Using ETTM systems, motorists can pay tolls in a hands-free, non-stop environment at highway speeds. These systems provide added toll plaza capacity, reduced fuel consumption, less congestion, cleaner air and increased productivity.

Numerous U.S. toll authorities currently use ETTM systems and all report high performance standards. Additional toll agencies are exploring ETTM technology for future electronic toll collection and traffic management functions, including the monitoring, collecting and reporting of real-time congestion information to motorists. Some toll agencies plan to use federal funds to install ETTM systems available under the IVHS provisions found in the Intermodal Surface Transportation Efficiency Act (ISTEA).

Our enclosed statement details the continued successes experienced by the motoring public when using ETTM services, and the ongoing activities for future ETTM operations across the country.

The Association asks that additional funding be provided specifically for ETTM research and development considering ETTM systems have a proven track record of successfully meeting transportation needs with overwhelming public support.

Thank you for your consideration.

Sincerely,

Ann D. Warner

Ann D. Warner
Director of Government Affairs

Enclosure

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REPRESENTING THE WORLDWIDE TOLL INDUSTRY • THERE ARE NO FREE ROADS

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Written Statement
for the record

IVHS Field Hearing
April 15, 1993

Transportation aand Related Agencies Subcommittee
House Appropriations Committee

Introduction

The International Bridge, Tunnel and Turnpike Association (IBTTA), the first founding member of the Intelligent Vehicle Highway Society of America (IVHS America), appreciates this opportunity to submit our written comments following the IVHS Field Hearing held April 15, 1993.

IBTTA, the trade association of the worldwide toll industry, represents toll authorities in 22 countries on five continents, including over 50 toll agencies in the United States. Member facilities carry in excess of seven billion vehicles a year.

Electronic Toll and Traffic Management

Definition

Recent technological advances allow the toll industry to collect tolls electronically in the accurate, efficient and cost-effective manner desired by the motoring public. Using Electronic Toll and Traffic Management (ETTM) systems, motorists can pay tolls in a hands-free, non-stop environment at highway speeds. ETTM provides added toll plaza capacity, reduced fuel consumption, less congestion, cleaner air and increased productivity.

ETTM systems allow drivers to pass through toll plazas equipped with tag readers. The reader communicates with a tag attached to the vehicle and records the transaction. Customers can either pre-pay with cash or by credit card to set up an account and receive a tag. ETTM customers enjoy the convenience and time-savings associated with hands-free, non-stop electronic toll collection. Drivers who choose not to use the ETTM system can continue to pay tolls manually.

Current Uses

Numerous U.S. toll authorities already use ETTM systems. All report high performance standards:

Texas

The Texas Turnpike Authority has been operating TOLLTAG, an ETTM system on the Dallas North Tollway since 1989. The system improves the Tollway's efficiency and reduces peak period congestion. This added capacity benefits all motorists, whether they are ETTM subscribers or not.

The Tollway has more than 53,000 tags issued to over 36,000 accounts. It processes over 20 million transactions each year virtually without error. The system is working in all toll lanes on the facility and has the enthusiastic support of the Tollway's patrons.

Oklahoma
ETTM has allowed the Oklahoma Turnpike Authority (OTA) to build new toll roads without traditional toll booths on the main line of the roadway. Motorists who participate in OTA's PIKEPASS system can pay tolls at highway speeds as they pass a toll collection point on the toll facility. Motorists who do not participate in PIKEPASS can exit the main line and pay their toll manually in a toll plaza on a service road parallel to the primary road.

PIKEPASS is operational on OTA's 10-road, 550-mile system. The agency has distributed PIKEPASS tags to more than 125,000 local, regional and interstate customers. The system accounts for 30 percent of all toll transactions in Oklahoma.

Louisiana
The Louisiana Department of Transportation and Development implemented its ETTM system, also called TOLLTAG, on the Crescent City Connection in New Orleans. Here, motorists have purchased some 25,000 car tags, and the facility averages 21,000 TOLLTAG transactions daily.

The Greater New Orleans Expressway Commission also uses ETTM on its Lake Pontchartrain Causeway. ETTM accounts for 60 percent of all daily transactions and is used by 11,000 cars and 500 trucks.

These two agencies are cooperating allowing motorists to use the same ETTM systems on both facilities.

Colorado
The E-470 Public Highway Authority in Englewood, Colorado uses the EXPRESSTOLL system on its Segment I Toll Plaza. About 1,500 cars and trucks use this system, including roughly 140 emergency vehicles resulting in 43 percent of all daily transactions. The toll plaza includes non-stop ETTM lanes and manual toll lanes.

Maryland
Advanced toll collection accounts for 110,000 tags -- with over 16,000 daily ETTM transactions amounting to 80 percent of all toll transactions -- on the Thomas J. Hatem Memorial Bridge. The Maryland Transportation Authority operates the bridge.

Texas
The Harris County Toll Road Authority in Houston, Texas opened its new EZ TAG system soon after the first of the year. Once fully equipped, the system will comprise 69 toll lanes.

New York - New Jersey
Applying ETTM to mass transit, more than 1,500 buses pass through the Lincoln Tunnel each day using an ETTM system offered by The Port Authority of New York and New Jersey.

Under existing Federal Communications Commission (FCC) interim procedures, adopted in 1974, these ETTM applications operate within the 900 MHz band on a secondary status.

ETTM Future Potential

As a result of these successes, additional toll agencies are exploring ETTM technology for electronic toll collection and traffic management. Some toll agencies plan to use federal funds to install ETTM. These funds are available under the Intelligent Vehicle Highway Systems (IVHS) provisions in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), P.L. 102-240. Projects currently taking advantage of ISTEA, or, other projects that may pursue the ISTEA funding options in the future include:

Northeast Corridor

Seven toll authorities in the Northeast formed an Interagency Group to select a compatible ETTM system for use by motorists throughout the New York, New Jersey and Pennsylvania region. These agencies are the New Jersey Turnpike Authority, New Jersey Highway Authority, South Jersey Transportation Authority, New York State Thruway Authority, Pennsylvania Turnpike Commission, The Port Authority of New York and New Jersey, and Triborough Bridge and Tunnel Authority. These agencies account for 37 percent of all toll transactions and 67 percent of all toll revenue in the United States.

E-ZPass, termed by the Interagency Group, will allow region-wide electronic toll collection at all toll facilities. These include river crossings, toll facilities serving central business districts, and intra- and inter-state roads operated by the seven member agencies. While each agency in the group is responsible for installing and operating ETTM on its own facility, the interagency approach will provide maximum convenience to motorists. It is anticipated that implementation of this technology will be phased-in over the next several years.

The Interagency Group plans to resume operational tests this July on two technologies that operate in the 900 MHz band (904 to 912 MHz and 918 to 926 MHz). Eventually, toll agency officials expect to process over one million E-ZPass transactions daily.

The size and scope of this project and its potential impact on millions of daily commuters and commercial drivers is enormous. Interagency Group members have allocated more than $63 million to fund E-ZPass activities during 1992 to 1996. The group will also use an additional $32 million in federal funds available from the Federal Highway Administration under ISTEA.

New England

In the New England area, seven transportation agencies are pursuing a Multi-Modal ETTM Program, promising to illustrate further the benefits of IVHS by combining toll, urban mass transit and ground airport facilities in one system. Participants include the Maine Turnpike Authority, Massachusetts Executive Office of Transportation and Construction, Massachusetts Highway Department, Massachusetts Turnpike Authority, Massachusetts Port Authority, New Hampshire Department of Transportation (Bureau of Turnpikes), Rhode Island Turnpike and Bridge Authority and the Massachusetts Institute of Technology's Region One University Transportation Center.

The New England Group aims to have its ETTM system working by 1994 for advanced taxi toll collection at area airports, river tunnel crossings, and certain roads for commercial traffic.

While these interagency efforts move forward, numerous individual toll authorities are proceeding with ETTM systems, including:

Georgia
The Georgia Department of Transportation (GDOT) plans to open the Georgia 400 Extension, a new limited-access highway in Atlanta, Georgia, in the next few months. GDOT plans to complete the facility by July 1993, including an advanced toll collection system in 18 lanes. Further plans are to expand ETTM to a total of 20 lanes. Federal funds helped develop the Georgia 400 Extension, a pilot project under the toll provisions of the Uniform Relocation Assistance Act of 1987.

Illinois
The Illinois State Toll Highway Authority is continuing its ETTM operational tests on its new North-South segment covering about 17 miles, and on a separate stretch near Chicago's O'Hare International Airport. ETTM will be used for advanced toll collection, to queue parked vehicles at the airport and to identify hazardous materials movements.

In the long term, ETTM also will provide important IVHS and traffic management functions, including the monitoring, collection and reporting of real-time congestion information to motorists. ETTM also will make possible the use of congestion pricing tests, provided for in ISTEA. Several metropolitan areas are considering road pricing, including:

California
ETTM technology will allow highway officials in California to collect tolls for the use of dedicated high occupancy vehicle (HOV) lanes by non-HOV motorists. Variable toll rates will allow officials to give commuters an incentive to avoid peak period travel and to form carpools.

Per current FCC guidelines, interim regulations adopted in 1974, most of these ETTM applications will be operating on a secondary basis in the 900 MHz frequency range.

Safeguarding Frequency

Although the Appropriations Committee does not have jurisdiction over frequency allocation issues, we would like to take this opportunity to bring to the Subcommittee's attention, a growing concern to the toll industry: safeguarding radio frequency for reliable, cost-effective ETTM operations. Due to the expanding development of IVHS applications, personal communication services and the like, competition to use limited available frequency is increasing.

IBTTA continues to oppose any legislation or regulatory initiative that would not provide adequate frequency space for IVHS uses, especially in the 900 MHz band. Many of the ETTM applications discussed earlier operate in this frequency. Such action would jeopardize successful ETTM applications and seriously hamper those agencies planning to use ETTM in the future. Highway officials could lose the ability to use proven technology to meet regional transportation and telecommunications needs.

Recommendations

The Association asks that Congress support President Bill Clinton's budget request for next year by appropriating $181 million for IVHS applications. While this spending initiative would be $70 million more than this year's level, IBTTA requests that a portion of these funds or additional monies be provided specifically for ETTM research and development considering ETTM systems have a proven track record of successfully meeting transportation needs with overwhelming public support.

Conclusion

ETTM continues to be an invaluable tool used by regional transportation planners when addressing road capacity and traffic congestion needs unique to their areas. IBTTA thanks the Subcommittee for considering ETTM applications when debating the entire IVHS-funding issue.

Should the Subcommittee request further information, please contact me or our director of government affairs, Ann Warner.

Respectfully submitted,

Neil Schuster
Neil D. Schuster
Executive Director

May 5, 1993

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Congreſs of the United States
House of Representatives
Washington, DC 20515-4610

COMMITTEE ON APPROPRIATIONS
SUBCOMMITTEES:
TRANSPORTATION
TREASURY—POSTAL SERVICE—GENERAL GOVERNMENT
COMMISSION ON SECURITY AND COOPERATION IN EUROPE

April 16, 1993

Mr. Frederick T. Tucker
Executive Vice President
Motorola, Inc.
4000 Commercial Ave.
Northbrook, Illinois 60062

Dear Mr. Tucker:

Thank you for taking time out of your busy schedule to testify at the transportation appropriations subcommittee's hearing on Intelligent Vehicle Highway Systems (IVHS).

I found your testimony very interesting and I regret that time limitations precluded the opportunity for more dialogue on this critical part of our transportation network's future. Since I did not have time to ask further questions, I would appreciate it if you would answer the enclosed questions for the record. If you would return your responses to my office, attention: Janet Powell, we will make sure they are included in the official hearing record.

Best wishes and thank you again for giving us the benefit of your expertise in this important matter.

Sincerely,

Frank R. Wolf
Member of Congress

FRW:jp

THANK Ya

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QUESTIONS FOR THE RECORD
IVHS HEARING
April 15, 1993

MR. WOLF

FOR MR. TUCKER:

1. You indicated in your testimony that our international counterparts have outspent us and that we are behind. How far behind foreign countries are we in the race to develop IVHS techology?

2. In your opinion, how much federal funding is needed to level the playing field so the U.S. private sector does not face a competitive disadvantage in the worldwide market for IVHS?

3. How much government funding is provided for IVHS in Japan? How does the U.S. compare to Japan in government support for IVHS?

4. You noted in your testimony that private sector participation in IVHS "is discouraged by a cumbersome procurement process" and that legislation may be necessary to change this. What legislative changes do you propose?

MOTOROLA INC.

May 12, 1993

The Honorable Frank Wolf
United States House of Representatives
104 Cannon House Office Building
Washington, DC 20515-4610

Dear Mr. Wolf:

I appreciated the opportunity to testify at the House Transportation Appropriations Subcommittee's hearing on IVHS, and I am pleased to be able to answer your follow-up questions.

Please note that while I testified in my capacity as Motorola's Executive Vice President, I am also answering these questions in my capacity as IVHS AMERICA's newly elected Chairman of the Board. Accordingly, my responses reflect IVHS AMERICA's positions.

Please let me know if you have any additional questions. Thank you for your time and your interest.

Sincerely,

MOTOROLA, INC.

Fred Tucker

Fred Tucker
Executive Vice President
General Manager
Automotive and Industrial Electronics Group

Attachment

cc: J. Costantino - IVHS AMERICA, Executive Director
R. Doi - Motorola, Vice President and Director IVHS
R. Haggart - Motorola, Vice President Government Relations
G. Schneider - Motorola, Legislative Representative

Responses to Follow-up Questions From Congressman Frank Wolf House Transportation Appropriations Subcommittee

Question 1. *You indicated in your testimony that our international counterparts have outspent us and that we are behind. How far behind foreign countries are we in the race to develop IVHS technology?*

The United States severely lags our international competitors in the deployment and public availability of IVHS technology. This is especially true when compared to Japan, which has made major strategic investments in IVHS over a twenty-year period. As a result, Advanced Traffic Management Systems (ATMS) are in operation throughout Japan. Over 75 metropolitan areas have computerized traffic control systems, and there are 160 traffic signal control centers in Japan. Additionally, many IVHS products are available to Japanese consumers. Over 500,000 in-vehicle navigation systems have been sold in the last five years, half of which are vehicle manufacturer installed. Every luxury car built in Japan offers an optional screen which will support an in-vehicle navigation system. Japan is also leading in testing communications between the roadside infrastructure and vehicles (integration between ATMS and Advanced Traveler Information Systems), which will permit early development of national standards.

Besides long-term planning, a major reason for the Japanese lead in deployment of IVHS is the strong role played by their central government in funding and deploying traffic management systems. The United States is at an institutional disadvantage in the area of deployment because IVHS will be bought, deployed, and maintained by state and local governments (albeit with Federal aid). Because the United States must develop consensus and achieve coordinated long-term planning between and among state and local governments, the U.S. may have difficulty in closing the deployment gap. The United States government must take the lead to encourage state and local governments to deploy available IVHS technologies.

The United States is probably five years behind Japan in widespread IVHS consumer product availability, one example being in-vehicle navigation systems. While Europe may be slightly ahead in operational tests, the recent dedication of the United States government should enable the United States to close the gap. Advanced Vehicle Control Systems (AVCS) is the only functional area of great developmental disparity between the United States and its international competitors. Since much technological development in this area is the proprietary information of automobile manufacturers, quantitative information is difficult to obtain. The Japanese had an earlier start than their U.S. counterparts; thus we must assume they are more advanced in vehicle sensors and control systems, which could result in earlier deployment than in the United States.

Question 2. *In your opinion, how much federal funding is needed to level the playing field so the U.S. private sector does not face a competitive disadvantage in the worldwide market for IVHS?*

Response:

Most of the "levelling" should come in the area of traffic management and information systems. ISTEA Funding Levels under the IVHS Act in Title VI cannot accommodate deployment, thus necessitating the emphasis on Title I utilization. Priority should also be placed on the allocation of funds for intermodal traveler information systems testing. This testing should be pursuant to establishing nationwide standards. With state and local governments' accelerated budgeting of matching funds and increases of those funds in FY 95, we would have greater opportunity of reaching parity with Japan. Furthermore, this funding increase would stimulate private sector development of IVHS equipment by the vehicle manufacturers (OEMs) and aftermarket equipment suppliers.

Some additional appropriations to sensor development and testing may also help close the gap. Rather than directly funding the private sector's efforts in AVCS, the government should concentrate on developing an infrastructure to support AVCS. Private companies, such as automobile manufacturers will then develop and market products that use the AVCS infrastructure.

Question 3. *How much government funding is provided for IVHS in Japan? How does the U.S. compare to Japan in government support for IVHS?*

While there is no question that the Japanese Government has invested more money over a longer period of time in IVHS than the United States, we lack specific information on the government funding differences. IVHS AMERICA has initiated a study to collect the data and conduct comparative analyses of the differences. We expect to have more information in about 120 days.

While we expect to accumulate reasonably accurate data on government investment, information on private sector investments and technologies is difficult to obtain, other than what is available in product release information. In our study, we will attempt to benchmark current and projected products in lieu of an investment analysis.

It should be noted that private and public sector investment in Japan is coordinated through government agencies such as MITI, thus promoting national standards and making their investments more effective than similar investments in the United States. For example, the Japan Digital Road Map Association, which provided the digital map databases required for in-vehicle navigation systems, was sponsored by the Ministry of Construction in conjunction with the leading Japanese automobile manufacturers and automobile electronics suppliers.

Question 4. *You noted in your testimony that private sector participation in IVHS "is discouraged by a cumbersome procurement process" and that legislation may be necessary to change this. What legislative changes do you propose?*

IVHS AMERICA's Legal Issues Committee recently completed a white paper on procurement issues in IVHS Development and Deployment. This paper represents our current statement of the problems and makes preliminary recommendations for the Federal government's response.

While most of the recommended responses deal with changes in Federal policy and procedures, legislation may be appropriate in the following areas:

- revisions to ISTEA to encourage interstate compacts enabling adherence to regional requirements and procurement of regional systems.

- statutory authority may be required to indemnify contractors, thus reducing or eliminating their liability by potentially lowering system and/or product prices; this would be particularly relevant to the Advanced Vehicle Control Systems arena.

I am forwarding you a copy of the paper and am requesting that the Legal Issues Committee review their recommendations with emphasis on recommended legislative actions. We will forward these recommendations to the Transportation Appropriations Subcommittee's staff when complete.

FRANK R. WOLF
10TH DISTRICT, VIRGINIA

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Congress of the United States
House of Representatives
Washington, DC 20515-4610

COMMITTEE ON APPROPRIATIONS
SUBCOMMITTEES
TRANSPORTATION
TREASURY—POSTAL SERVICE—GENERAL GOVERNMENT
COMMISSION ON SECURITY AND COOPERATION IN EUROPE

April 16, 1993

Mr. S. Edwin Rowe
3236 Cabo Blanco Dr.
Hacienda Heights, California 91745

Dear Mr. Rowe:

Thank you for taking time out of your busy schedule to testify at the transportation appropriations subcommittee's hearing on Intelligent Vehicle Highway Systems (IVHS).

I found your testimony very interesting and I regret that time limitations precluded the opportunity for more dialogue on this critical part of our transportation network's future. Since I did not have time to ask further questions, I would appreciate it if you would answer the enclosed questions for the record. If you would return your responses to my office, attention: Janet Powell, we will make sure they are included in the official hearing record.

Best wishes and thank you again for giving us the benefit of your expertise in this important matter.

Sincerely,

Frank R. Wolf
Member of Congress

FRW:jp

THANK You

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QUESTIONS FOR THE RECORD-MR. WOLF-4/15/93

FOR MR. ROWE:

1. In your testimony, you noted that a major institutional issue facing the IVHS program involves the operation and maintenance of Advanced Traffic Management Systems (ATMS) by state and local agencies. You noted that in a recent review, FHwA determined that only two of 24 representative systems were properly operated and maintained. In the Washington region, we frequently experience inaccurate information displayed on the variable message signs on I-66. Since IVHS is about providing real time information to commuters what should we do to maximize the effect of this basic building block of IVHS?

2. How are the changeable message signs operated on the Los Angeles Smart Corridor Project and what kind of information is displayed? For example, do you only provide a message when you want to alert drivers to something, or, do you use continuous "filler" material in between "news flashes" such as the time of day? Which method is more effective?

S. Edwin Rowe
3236 Cabo Blanco Dr.
Hacienda Heights, CA 91745

Tel/Fax:(818) 330-4082

May 19, 1993

Honorable Frank R. Wolf
Member of Congress
104 Cannon Building
Washington, DC 20515-4610

ATTENTION Janet Powell

Dear Congressman Wolf:

Thank you for your letter of April 16, regarding my testimony to the Transportation Appropriations Subcommittee hearing on Intelligent Vehicle Highway Systems. You expressed further interest in my comments for inclusion in the official record on two questions that you did not have an opportunity to ask at the hearing.

The inaccurate information that you noted is appearing on changeable message signs in the Washington region on I-66 may well be another example of the national problem which my testimony covered. Many jurisdictions are not providing the resources necessary to adequately operate and maintain existing traffic management systems, which are less complex than contemplated systems that will be implemented under the IVHS program. The solution to this serious national problem will involve a wide ranging program to improve training of operations and maintenance personnel, provision of enough staff to perform essential functions, provision of the right types of staff, development of minimal acceptable performance standards for operations and maintenance, changes in procurement practices that are inappropriate for high-tech equipment, internal reorganization, improved technology transfer between agencies, and allocation of sufficient transportation funds to achieve all of the above. These actions are described in some detail in the Federal Highway Administration's Expert Panel Report on Traffic Control Systems Operations and Maintenance, March 10, 1992. The FHWA has initiated an action plan to implement recommendations contained in this report.

With regard to any specific instance of improperly operated or maintained traffic control/information devices such as the changeable message signs you mentioned, it is not possible to recommend specific measures to correct the problem without personally reviewing the matter with the responsible agency. It is likely, however, that a permanent improvement in the situation would involve several of the actions listed above.

Your second question dealt with the policy issue of what type of information should be displayed on changeable message signs -- should continuous "filler" material be inserted between infrequent significant messages regarding accidents, congestion, ramp closures, construction activities, etc. In the Los Angeles area and elsewhere in California, our policy is to leave the changeable message signs blank until such time that a significant message needs to be communicated to drivers. During the 1970's, "filler" material was used, but generated considerable negative public comment. This was at least in part due to the type of "filler" material which consisted of limericks promoting various socially desirable objectives such as ride sharing.

The basic rational behind the current California policy is that drivers will tend to "tune out" changeable message signs that contain "filler" material most of the time interspersed with only occasional significant messages of interest. To my knowledge most states follow the policy of only presenting significant messages pertaining to the safety and operation of the highway and leave the changeable message signs blank at other times.

I appreciate your interest in these types of traffic management issues and would be pleased to respond to any further questions you may have.

Very truly yours,

Ed Rowe

S. Edwin Rowe

WEDNESDAY, MAY 12, 1993.

CRUMB RUBBER MODIFIED ASPHALT

WITNESS

HON. ESTEBAN TORRES, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

OPENING REMARKS

Mr. CARR. Good morning. The Committee will come to order.

STATEMENT OF THE HONORABLE ESTEBAN TORRES

Mr. CARR. Our first witness this morning is my good friend from California, Congressman Torres. Tell us what we need to know.

Mr. TORRES. Thank you, Mr. Chairman, for providing me this opportunity to testify before the subcommittee on the use of crumb rubber on asphalt pavement. I am not going to read my entire statement but I would ask, with your permission, to submit it for the record, and for the record as well I would like to submit the testimony of the California State Department of Transportation.

Mr. CARR. Without objection, it will be entered into the record.

Mr. TORRES. Thank you.

I am here today because I support Section 1038 of the Intermodal Surface Transportation Act, ISTEA. This section is intended to encourage the use of crumb rubber modifiers in Federally funded highway programs.

Over the past 20 years, hundreds of tons of crumb rubber made from ground-up automobile and truck tires has proven to be a safe and cost-effective additive to asphalt. Not only that, but numerous studies, especially in my State of California, have proven rubber modified asphalt to last longer than conventional asphalt.

I have long been active in encouraging high-value recycling of scrap tires. During the last few Congresses I have introduced legislation which would establish a national system by which scrap tires could be effectively recycled. Recently, for the third time, I reintroduced the Tire Recycling Incentives Act, H.R. 1810, which I would like to submit for the record.

Section 1038 of ISTEA is not designed to dispose of scrap tires. The provision is designed to encourage States to build longer-lasting, lower-maintenance roads. Indeed, the Federal Highway Administration term for asphalt pavements containing recycled rubber is called "crumb rubber modifiers," not crumb rubber additives.

Section 1038 of ISTEA is an innovative statute which was drafted based on substantial research demonstrating that crumb rubber modifiers are safe, environmentally sound, recyclable and cost effective. The statute was drafted and adopted by Congress requiring that negative performance, recyclability and emissions characteristics must be evident—I want to underscore that—must be evident, in order to waive the minimum utilization requirement contained in the provision.

Section 1038 is self-implementing because the preponderance of evidence, accumulated over the past 20 years, favor greater utilizations of these technologies.

Section 1038 requires that the Federal Highway Administration and the U.S. Environmental Protection Agency report to Congress by June 18th, 1993, a scant month away, on emission, performance and recyclability aspects of crumb rubber modifiers. Both the Federal Highway Administration and the EPA have been working diligently during the past 18 months to meet this critical deadline. I look forward to receiving the Federal Highway Administration and EPA report on June the 18th.

I want to take this opportunity to thank you and my colleagues, and urge you not to make judgments on any aspects on these technologies until the report has been released and carefully reviewed.

I applaud the attention this subcommittee is giving to this issue and I would like to urge the committee to include language in the committee report to encourage prompt completion of the objective and thorough analysis of these products currently being conducted by the Federal Highway Administration and EPA.

Mr. Chairman, in conclusion, your hearing today sends an important message to State highway departments and the paving industry that significant efforts must be made to improve the quality of our nation's roads. Improvement can result in this instance through the use of ground rubber, from scrap tires, as modifiers to asphalt pavements.

The important side benefit of greater usage of these technologies is the high value recycling of ground rubber from tens of millions of scrap tires that our country has today.

I want to thank you again, Mr. Chairman, for giving me the opportunity to testify before your subcommittee.

[The prepared statements of Hon. Esteban Torres and the California State Department of Transportation follow:]

CONGRESSMAN ESTEBAN E. TORRES

May 12, 1993

Subcommittee on Transportation

Thank you, Chairman Carr, for providing me the opportunity to testify before your Subcommittee on the use of crumb rubber in asphalt pavement.

I am here today because I support Section 1038 of the Intermodal Surface Transportation Act (ISTEA). This section is intended to encourage the use of 'Crumb Rubber Modifiers' in federally funded highway programs. Over the past twenty years hundreds of tons of 'crumb rubber, made from ground up automobile and truck tires, has proven to be a safe and cost-effective additive to asphalt.

I have long been active in encouraging high-value recycling of scrap tires. During the past several Congresses I have introduced legislation which establishes a national system by which scrap tires are most effectively recycled. I recently reintroduced **The Tire Recycling Incentives Act**, H. R. 1810, and I would like to submit a copy for the record.

My interest in asphalt pavements containing recycled rubber is especially strong because the characteristics of ground rubber, when mixed with asphalt cement, have been proven to enhance the durability properties of asphalt pavements. When ground rubber from scrap tires is used to modify asphalt pavements the result is better roads.

Section 1038 of ISTEA is not designed to "dispose" of scrap tires. The provision is designed to encourage states to build longer lasting, lower maintenance roads. Indeed, the Federal Highway Administration (FHWA) term for asphalt pavements containing recycled rubber is "Crumb Rubber Modifiers," not "Crumb Rubber Additives."

Section 1038 of ISTEA is an innovative statute which was drafted based on substantial research demonstrating that Crumb Rubber Modifiers are safe, environmentally sound, recyclable and cost-effective. The statute was drafted and adopted by Congress requiring that negative performance, recyclability and emissions characteristics must be evident in order to waive the minimum utilization requirement contained in the provision. Section 1038 is self-implementing because the preponderance of evidence, accumulated during the past twenty years, favors greater utilization of these technologies.

I am extremely proud of the leadership that the State of California has demonstrated in using these technologies. Our state transportation department, CALTRANS, has conducted extensive research on all Crumb Rubber Modifier technologies in varying climates. As you know, California has nearly all climactic and road conditions within the state's boundaries. CALTRANS builds roads in desert and mountain regions, in dry and wet climates.

As a result of that research, CALTRANS has adopted preliminary design guidelines for use of Asphalt Rubber Hot Mix (ARHM) which allows substantially reduced pavement thickness when the Crumb Rubber Modifier technology is used in place of conventional asphalt pavement. These guidelines, a copy of which I will submit for the record, have been approved for use by Region 9 of the Federal Highway Administration. The CALTRANS guidelines are the first in the nation to allow routine use of Crumb Rubber Modifiers at reduced lift thickness. The guidelines demonstrate the proven superior performance of Crumb Rubber Modifiers.

Section 1038 requires that the Federal Highway Administration (FHWA) and the U. S. Environmental Protection Agency (EPA) report to Congress by June 18, 1993 on emission, performance and recyclability aspects of Crumb Rubber Modifiers. Both FHWA and the EPA have been working diligently during the past eighteen months to meet this important deadline.

Secretary Pena and Administrator Browner can waive the minimum utilization requirements **only if negative evidence exists on these characteristics of Crumb Rubber Modifiers.** The FHWA and the EPA have collected and analyzed hugh volumes of data on Crumb Rubber Modifiers in order to assess the various characteristics of these products. While some may claim that insufficient research has been conducted on which to judge whether there exists negative evidence, I believe that twenty years of accumulated evidence is sufficient. I look forward to receiving the FHWA and EPA Report to Congress on June 18th, and I urge my colleagues not to make judgements on any aspects of these technologies until that report has been released and carefully reviewed.

Finally, Mr. Chairman, I understand that several organizations have raised concerns relative to the cost of Crumb Rubber Modifier products. States such as California, Arizona, Florida and Texas are curing these products extensively because they are cost-effective when considering the cost of the lifecycle of pavement. While these products are slightly more expensive on an initial per ton cost basis, longer lasting pavements ar reduced lift thickness can result in cost savings when considering total project cost.

With your permission, Mr. Chairman, I would also like to submit for the record, a recent cost analysis of actual Crumb Rubber Modifier projects in California to conventional paving alternatives. These cost comparisons demonstrate that Crumb Rubber Modifiers are cost-effective today, even without the economies of scale which would be experienced through greater usage.

My final point on cost is perhaps the most important. Our European friends have learned that basing road construction on performance versus low-bid specifications have resulted in better, longer-lasting highways. Perhaps greater use of Crumb Rubber Modifiers, which are used extensively in Europe, will help teach us the same lesson.

I applaud the attention that this Committee is devoting to this issue and I would urge the Committee to include language in the Committee Report to encourage prompt completion of the objective and thorough analysis of these products currently being conducted by FHWA and EPA.

In conclusion, Mr. Chairman, your hearing today sends an important message to state highway departments and the paving industry that significant efforts must be made to improve the quality of our nation's roads. Improvement can result, in this instance, through the use of ground rubber from scrap tires as modifiers to asphalt pavements. The fortunate side benefit of greater usage of these technologies is the high-value recycling of ground rubber from tens of millions of scrap tires.

Thank you for giving me the opportunity to testify.

State of California Business, Transportation and Housing Agency

Memorandum

To: ALL DISTRICT DIRECTORS

Attention District Materials Engineers

Date : February 28, 1992

File:

From: **DEPARTMENT OF TRANSPORTATION**
Division of New Technology, Materials and Research

Subject: **DESIGN GUIDE FOR ARHM-GG**

Attached is a Guide for your use when considering one type of asphalt concrete containing reclaimed tire rubber that is eligible for Federal funding on pavement rehabilitation projects. The Guide contains the procedure we will be using to select asphalt rubber hot mix-gap graded (ARHM-GG) design thicknesses. ARHM-GG is the only type of rubber modified pavement addressed herein because it appears to be the most promising of those we have studied. The use of ARHM-GG as set forth in this Guide should be considered non-experimental. ARHM-GG pavement designs that do not conform to this Guide should, therefore, be considered as experimental. Other types of asphalt concrete containing reclaimed tire rubber are also eligible for Federal funding. However, the data currently available regarding these other mixes is inconclusive. When data supports their routine use, a design guide will be developed for them.

FHWA has approved our proposal to use this Guide. However, it is important to note that this is an Interim Guide and that it will be modified as suggested by the results of current and future research by Caltrans and others. We must, therefore, continue to construct experimental sections based on equivalences other than those implied by this Interim Guide. If you have any questions regarding the use of this Guide, contact Joe Hannon or Jack Van Kirk of my staff at 8-497-2353 and 8-497-2357 respectively.

The attached specifications should be used for ARHM-GG. If you have any questions regarding these specifications, please contact Jack.

EARL SHIRLEY, Chief,
Division of New Technology,
Materials and Research

Attachments

cc: JBednar - FHWA
JMassucco - FHWA
BManning - LSR
DMayer - OE
KMori - OPPD
TBressette
JHannon
JVanKirk

March 1992

Asphalt Rubber Hot Mix-Gap Graded
Thickness Determination Guide
(Interim)

Procedure:

1. Determine the thickness of conventional DGAC required for the structural needs of the pavement (based on deflections and structural section stiffening using current Caltrans procedures).

2. Determine the thickness of conventional DGAC required to retard reflection cracking (using current Caltrans procedure).

3. Select a DGAC overlay thickness that satisfies the requirements of 1 and 2 above.

4. Use either Table 1 or Table 2 to determine the ARHM-GG equivalent sections, with and/or without SAMIs. Use Table 1 if structural needs control and Table 2 if reflection crack retardation controls.

5. If the ride score of the pavement to be rehabilitated is greater than the allowable maximum and there is no structural need per 1 above, select one of the following:

   a) Place two 0.10' thick lifts of ARHM-GG or

   b) Cold plane to a depth of 0.10', then place ARHM-GG as determined per Steps 1 thru 4 above.

Table 1
Structural Equivalencies

THICKNESS (ft.)

DGAC	ARHM-GG[1]	ARHM-GG on a SAMI
0.15	0.10[2]	-
0.20	0.10	-
0.25	0.15	0.10
0.30	0.15	0.10
0.35	0.20	0.15
0.40	0.20	0.15
0.45	0.15[3]	0.20
0.50	0.15[4]	0.20
0.55	0.20[3]	0.15[3]
0.60	0.20[4]	0.15[4]

Notes:

1. The maximum allowable non-experimental equivalency for ARHM-GG is 2:1.
2. The minimum allowable ARHM-GG lift thickness is 0.10'.
3. Place 0.15' of new DGAC first.
4. Place 0.20' of new DGAC first.
5. ARHM-GG may not prevent cold weather induced transverse cracks.

Table 2
Reflection Crack Retardation Equivalencies

THICKNESS (ft.)

DGAC	ARHM-GG	ARHM-GG on a SAMI
0.15	0.10[1]	-
0.20	0.10	-
0.25	0.15	-
0.30	0.15	-
0.35[2]	0.15 or 0.20[3]	0.10[4]

Notes:

1. The minimum allowable ARHM-GG lift thickness is 0.10'.
2. A DGAC thickness of 0.35' is the maximum thickness recommended by Caltrans for reflection crack retardation.
3. Use 0.15 if the crack width is <1/8" and 0.20 if the crack width is ≥1/8".
4. Use if the crack width is ≥1/8". If <1/8", use another strategy.
5. ARHM-GG may not prevent cold weather induced transverse cracks.

COST COMPARISON:

ASPHALT-RUBBER STRATEGIES vs. CONVENTIONAL ASPHALT CONCRETE STRATEGIES

The use of Asphalt-Rubber in road rehabilitation projects has increased dramatically over the past year and is very likely to continue increasing in the future. While this is due in part to recent changes in the legislation that governs the use of pavements containing recycled tire rubber, it is also true that questions concerning the performance of the material have all but been eliminated in recent years. Now that the recyclability of pavements containing ground tire rubber is no longer an issue, the only reservations that agencies might still have concern the cost of the material.

To address these concerns, several projects in which Asphalt-Rubber and conventional asphalt concrete strategies were bid as alternates have been examined. In Orange County alone, there were 10 such projects bid over the two month period of November to December 1992. The following data has been divided into two groups in order to illustrate both the initial and long term cost benefits of Asphalt-Rubber. In those cases where specific strategies varied significantly between the Asphalt-Rubber and conventional asphalt concrete alternatives, the relevant bid items have been examined on an individual cost basis to show the source of the over-all cost difference.

The results of this cost comparison are conclusive. In cases where the state adopted design guidelines for Asphalt-Rubber were utilized to reduce the lift of an overlay or avoid excessive removals, the Asphalt-Rubber alternative reduced the cost below that of the conventional asphalt concrete between 3% to 24.75%. Over time, the longer life span of

LONG TERM COST COMPARISON - EQUAL THICKNESS DESIGN

1.) PROJECT: City of Mission Viejo #STPLN 5451-001; Marguerite Pkwy.
LOW BIDDER: R.J. Noble Inc.

Base Bid: Asphalt Concrete Overlay
AC overlay (.15 ft.) &
Pav. Reinf. Fab. (total): $692,518.45

Alternate 1: ARHM
ARHM overlay (equal thickness) $798,832.50

Conclusion: Asphalt-Rubber alternative initially costs 15% more than the conventional asphalt concrete alternative, but has an 85% lower cost over the life of the project.

2.) PROJECT: City of Yorba Linda #STPLN 5402; Yorba Linda Blvd.
LOW BIDDER: Boral Resources Inc.

Alternate A: Asphalt Concrete Overlay
AC overlay & Pav. Reinf. Fab. $314,575.00

Total Project Cost: $964,039.37

Alternate B: ARHM
ARHM overlay (equal thickness
to AC alternate) $538,430.00

Total Project Cost: $1,187,894.37

Conclusion: Asphalt-Rubber alternative initially costs 23% more than the conventional asphalt concrete alternative, but has a 77% lower cost over the life of the project.

3.) PROJECT: City of Mission Viejo #STPLN 5451-002; Los Alisos Blvd.
LOW BIDDER: R.J. Noble

Base Bid: Asphalt Concrete & P.R.F. Overlay
Total Project Cost: $483,318.50

Alternate 1: ARHM (equal thickness)
Total Project Cost: $611,643.50

Conclusion: Asphalt-Rubber alternative initially costs 27% more than the conventional asphalt concrete alternative, but has a 73% lower cost over the life of the project.

4.) PROJECT: Mission Viejo #STPLN 5451-005; Trabuco Rd.
LOW BIDDER: R.J. Noble

Base Bid: Asphalt Concrete & P.R.F.	
Total Project Cost:	$319,320.30
Alternate 1: ARHM (equal Thickness)	
Total Project Cost:	$402,400.30

Conclusion: Asphalt-Rubber alternative initially costs 26% more than the conventional asphalt-concrete alternative, but has a 74% lower cost over the life of the project.

INITIAL COST COMPARISON: REDUCED LIFT DESIGN

1.) PROJECT: City of Fountain Valley #TI 2604; Brookhurst Street
LOW BIDDER: Boral Resources Inc.

Alternate A: Asphalt Concrete Overlay - .15 ft.

Item:	Cost:
AC & AB removal - .65 ft.	$46,956
AC for removal areas	$140,033
Pav. Reinf. Fab.	$16,653
AC overlay	$73,360
Total:	$274,002
Total Project Cost:	**$345,033.38**

Alternate B: Asphalt-Rubber Hot Mix - .15 ft.

Item:	Cost:
Cold Mill - .17 ft.	$15,769
AC leveling course	$42,240
ARHM overlay	$165,200
Total:	$224,603
Total Project Cost:	**$294,675**

Conclusion: Conventional asphalt concrete alternative costs 17% more than the Asphalt-Rubber alternative.

2.) PROJECT: City of Fountain Valley #GT 2606
LOW BIDDER: Alt. A: Shawnan Corp. Alt. B: Silvia Construction Inc.

Alternate A: Asphalt Concrete Overlay - .2 ft.

Item:	Cost:
Pulverization/Cement treat	$76,680
Remove pul. material	$10,400
AC & AB removal	$11,715
AC for removal areas	$49,680
AC leveling course	$38,400
Pav. Reinf. Fab.	$18,980
AC overlay	$98,750
Total:	$304,605
Total Project Cost:	**$409,045.80**

Alternate B: ARHM Overlay - .15 ft.

Cold Mill	$27,326
AC leveling course	$102,090
ARHM overlay	$154,500
Total:	$283,916
Total Project Cost:	**$344,250.45**

Conclusion: Conventional asphalt concrete alternative costs 19% more than the Asphalt-Rubber alternative.

3.) PROJECT: City of San Diego #K3536/93; Inspiration Point
LOW BIDDER: Superior Ready Mix

Alternative A: Asphalt Conrete Overlay - .2 ft.

Total Cost of AC Overlay:	$132,423.20
Total Project Cost:	$147,909.00

Alternative B: ARHM Overlay - .1 ft.

Total Cost of ARHM Overlay:	$124,341.30
Total Project Cost:	$143,195.93

Conclusion: Conventional asphalt concrete alternative costs 3% more than the Asphalt-Rubber alternative.

4.) PROJECT: City of Whittier; Pavement Surface Treatment '92 - '93
LOW BIDDER: Manhole Adjusting Inc.

Alternate A: Asphalt-Rubber Cape Seal

Item:	Cost:
Type II Slurry Seal (1230 tns)	$77,809.80
Asphalt-Rubber & Aggregate Membrane	$91,052.64
Total:	$168,862.44
Total Project Cost:	$184,757.64

Alternate B: Slurry Seal & Asphalt Concrete Overlay

Item:	COST:
Type II Slurry Seal (760 tns)	$57,000
AC Overlay	$109,755
Pav. reinf. Fab.	$36,132
Total:	$202,887
Total Project Cost	$254,902

Conclusion: Conventional asphalt concrete alternative costs 24.75% more than the Asphalt-Rubber alternative.

5.) PROJECT: City of San Buenaventura #414; Residential Overlay
LOW BIDDER: S.P. Milling
Alternate A: Asphalt Concrete Overlay

Item:	Cost:
Pav. Reinf. Fab.	$31,752
Asphalt Concrete (10,140 tns)	$248,430
Total Project Cost:	$475,272
Alternate B: Asphalt-Rubber 2 Layer System	
Asphalt-Rubber & Aggregate Membrane	$64,809.60
ARHM Overlay (6040 tns)	$322,200.00
Total Project Cost:	$479,272.00

Conclusion: Only a 40% reduced lift (not the Caltrans' suggested 50% reduction) was utilized on this project. The additional thickness will result in an approximate 60% longer service life, relating to a 59% lower cost over the life of the project.

Asphalt-Rubber pavements will add to the cost savings shown here. It is also important to note that over this same period of time, two other projects that bid in Orange County were determined at the time of design to be so vastly reduced in price compared to a conventional asphalt strategy, that it was not worth the administrative effort to prepare alternate bids.

In those cases in which Asphalt-Rubber was not used in a reduced lift or to avoid excessive removals, the initial cost of the Asphalt-Rubber alternative was between 15% to 27% higher than the respective asphalt concrete alternative. However, when an analysis is made regarding life cycle costs, in cases where Asphalt-Rubber and conventional asphalt concrete sections are compared in equal thicknesses, the Asphalt-Rubber section will last at least 100% longer than (two times as long as) the asphalt concrete section. This life cycle comparison has been established over a 15 year period using Caltrans test data. Therefore, the conservative life cycle cost of these projects will range from 77% to 85% lower than conventional asphalt concrete strategies. Asphalt-Rubber is cost effective on a ton for ton basis compared to conventional asphalt concrete.

TESTIMONY FOR INCLUSION IN THE RECORD OF THE APPROPRIATIONS SUBCOMMITTEE ON TRANSPORTATION HEARING OF MAY 12, 1993

SUBMITTED BY THE CALIFORNIA DEPARTMENT OF TRANSPORTATION

California is pleased to submit for the record the following testimony concerning the use of rubberized asphalt concrete (RAC). As we testified during the 1991 ISTEA deliberations, California has had considerable experience in the use of rubberized asphalt and was involved in its use well before the adoption of the requirements of section 1038.

Our research and experience with the materials has lead to the following conclusions. Asphalt concrete (AC) pavement containing recycled rubber costs 50 to 100% more than conventional AC per ton in-place. Because of this, the California Department of Transportation's (Caltrans) research since 1983 has been directed at determining whether pavement thicknesses can be reduced and still get the service life desired. If so, this would reduce or eliminate the need for additional funds at the time of construction.

In addition to Caltrans, several California cities and counties also have considerable experience with some of these types of pavements. Based on several studies and our collective experience, Caltrans has determined that the use of AC containing recycled rubber or rubberized asphalt concrete (RAC) can be cost-effective when used in reduced thicknesses (as compared to conventional AC design thicknesses).

In February 1992, after first receiving Federal Highway Administration approval, Caltrans issued an interim design guide for one type of RAC, Asphalt Rubber Hot Mix Gap Graded (ARHM-GG). This design guide is now being used in California when ARHM-GG is determined to be an appropriate rehabilitation strategy for pavements.

Based on present usage of RAC, and a trend towards increased future usage, California will easily meet the requirements of Section 1038 of ISTEA in 1994. Caltrans is, however, concerned about the lack of completed research on (1) whether there is a threat to human health and the environment associated with the production and/or use of RAC and (2) whether asphalt pavement containing recycled rubber can themselves be recycled. Caltrans is, therefore, developing plans to address these issues by recycling some rubber modified AC on one or two projects during 1993-94. Considerable additional research, as identified in ISTEA, will still be needed to completely understand the advantages and disadvantages of the material.

California, while preferring that Congress provide to the states broad discretion with respect to the use of highway construction materials, is prepared to fully meet the requirements of the ISTEA legislation with respect to the use of rubberized asphalt. At the same time, Caltrans recognizes that other states, with little or no experience with the material, may not share our confidence in its use. These states may therefore seek relief from the requirements of section 1038 of the 1991 act.

FHWA/EPA STUDY ON EMISSION, PERFORMANCE, AND RECYCLABILITY

Mr. CARR. We thank you for your statement and your advice to the Committee.

You mentioned the study, which is due when?

Mr. TORRES. June the 18th of this year, Mr. Chairman. Just around the corner.

Mr. CARR. One of the problems that we have, of course, is that the ISTEA did not wait for completion of the study. It mandates certain percentages for certain years, beginning in 1994. Since this is our last opportunity to influence what happens in 1994, we have to make our decision before we get the benefit of any study. We all like to wait for studies, and that is one of the reasons why we are holding this hearing today, because there has been some serious objections raised to mandating 5 percent of crumb rubber modifiers be used in asphalt in 1994. Were you on Public Works before you joined our Committee?

Mr. TORRES. No, sir.

CALTRANS EXPERIENCE

Mr. CARR. Well, that is a good sign. And we are delighted to have you on our Committee.

But ISTEA prejudged the situation without waiting for a study. And so our ability to wait for the study is going to be very complicated, much as we would like to.

The California Department of Transportation (Caltrans) statement indicates that using recycled rubber costs 50 to 100 percent more than conventional asphalt.

Now, they go on to say that assuming you can get the same pavement performance at a reduced thickness, they apparently believe, and they just state it in a conclusory way, and I quote: "that the use of asphalt concrete containing recycled rubber or a rubberized asphalt concrete can be cost effective when used in reduced thicknesses." That is important key for this Committee to know.

Assuming this is true and assuming Caltrans' conclusory statement that it is cost effective, is it based on just the California experience, that can be applied to a couple of similar geographic areas of the country.

I come from a State where we have a very mean freeze-thaw cycle. In Michigan where we have cycles of freezes and thaws, and then when it finally thaws for good, our highway conditions stabilize for the period of the summer. Then we have the same problem going into winter. It will freeze and then it will thaw. We will have an Indian summer, then it will freeze and thaw, and then finally freeze and stabilize for the rest of the winter.

So I am not sure, for example, in a State like Michigan, that the arguments of the California experience, where your temperatures and climates tend to be much more constant throughout the year would have the same impact. In other words, Michigan may need thicker asphalt, because of our climactic conditions, than California. In which case we don't get any advantage from the higher cost that is forced on our State through the use of recycled rubber.

So those are some of the questions that are being asked, and the ISTEA legislation appears to be somewhat unforgiving of some of these other situations that are going on. So that is the reason we are having this hearing today, to try to determine if there is a cost impact that is adverse to the Federal taxpayers in some parts of the country. Even though California may be having a wonderful time with this stuff, we are hearing from other parts of the country where it may not be true.

But we are thankful that you are here and for bringing the testimony from the State of California.

Mr. TORRES. Thank you, Chairman Carr. It is obviously with that intent that I come to you this morning, to provide some assistance for your consideration of this critical issue.

Thank you.

RECYCLABILITY

Mr. CARR. Mr. Regula?

Mr. REGULA. Thank you, Mr. Chairman.

Has California had any experience of recycling? That is the thing they do on the roads where they peel off the top layer and grind it up, remix, and put it back down. Have you done that with this particular material?

Mr. TORRES. It is my understanding, Mr. Regula, that we have, and I presented to the Committee this morning a report from the California State Department of Transportation speaking to this particular issue and the utilization.

Mr. REGULA. I don't believe they addressed the question in the statement of recycling material. Perhaps they haven't used it long enough to go back around and peel it off and regrind and reuse, as is commonplace anymore with asphalt.

Mr. TORRES. You are asking whether crumb rubber modifiers have been used in asphalt to provide surface?

Mr. REGULA. No, I know it has been used in providing surface, but one of the things highway departments are doing now to avoid a buildup, so they don't have to raise the sewer manholes and so on, is to take a machine and just peel off a couple of inches of the asphalt, run it through a crusher, mix in some fresh material, and lay it back down again. That way the curbs stay uniform, and the manholes and so on.

My question is, has California done that with the recycled material?

Mr. TORRES. I am not exactly sure of that, Mr. Regula.

Mr. CARR. Will the gentleman yield?

I might be able to answer that question. In fact, the City of Los Angeles, or perhaps it is Los Angeles County, has a very vigorous program of recycling asphalt pavement, called RAP, and the problem with RAP is that it is not 100 percent reusable.

Mr. REGULA. No, I understand that.

Mr. CARR. That is, you have to add new aggregate with it. But there is now a new process licensed out of the State of Texas, I understand, which Los Angeles is also now using, which I guess the trade name is called Cyclene. In this process, you can get virtually 100 percent reuse by microwaving the reusable. If you get 100 percent recycling, then you can avoid the landfill costs of recycling that you had with RAP. And L.A. is doing this. It has a very vigorous program. But this process may not lend itself to the use of rubber.

This is yet another reason perhaps to go slow on the use of rubber, because rubber tires sometimes contain metal, and one of the problems of microwaving, as you know, is if you put something metal in your microwave, you can get a spark. And the same thing happens in this process. So metal removing is a problem.

In other words, there appears to be somewhat of a tradeoff. If you want 100 percent recyclability using microwaves from the stuff you strip up and pick up off the street, then your ability to do so is retarded if you have to be forced to put rubber components in it. It complicates the process.

Mr. TORRES. Thank you, Mr. Chairman. That is why you are Chairman.

Mr. CARR. I know what is going on in California.

Mr. TORRES. I appreciate that.

Mr. CARR. Mr. Price?

STATE FLEXIBILITY IN RECYCLING

Mr. PRICE. I thank you, Mr. Chairman.

I'm glad to have our colleague from California here and lead off on what we believe will be a productive morning of discussion of this topic of the use of scrap tires in paving.

I have only one question. It has to do with the bill that you cite here, that you have introduced, H.R. 1810, which I believe you call the Tire Recycling and Incentives Act.

Mr. TORRES. That is correct.

Mr. PRICE. It is a general question, as to how we might best approach this environmental challenge. You are talking here about the States providing certain incentives for the use of these materials. What kind of structure do you envision in the States? What kind of a program in the States does this bill project?

I guess my question really goes to whether the kind of mandatory approach represented in ISTEA is consistent with the general philosophy of your bill here.

Is it appropriate to require of all the States, that a certain percentage of their paving materials consist of this material? Is that consistent with the kind of philosophy you are putting forward in this bill?

INCENTIVES TO RECYCLE

Mr. TORRES. Essentially, Mr. Price, if you will, we have to look at it from the perspective that today across America we have not millions but billions of tires blighting our countryside, our rivers, our waterways, causing tremendous environmental and health hazards, because of what tires collect, the rainwater and breeding ground for vermin, et cetera, et cetera, not to speak of the problem that we have in disposing of them in landfills, which is almost prohibitive. They float to the top of the landfill and disrupt the daily cover.

My concept is if we could provide a market incentive to the producers of tires, a market incentive that would allow them instead of piling up tires, because they have no use after their life span, to take those tires and recycle them in to different forms by producing crumb rubber to utilize in other types of products, like hoses, rubber mats, et cetera, et cetera. We can also include some of that crumb rubber in what we are talking about here today, the utilization in asphalt, to pave our airstrips, our highways and all areas where we need pavement.

Then we would give the tire-producing industry an incentive to want to recycle. We create the added modifiers, if you will, of crumb rubber to new products, tires and other rubber-type products. It would create a whole new industry. A tire recycling industry that would create jobs.

But it is a market incentive program where you give the manufacturer the incentive to utilize this process and reduce, the millions and millions of tires, that are discarded at the end of a year.

Mr. PRICE. I understand, and I think there is much that is very promising about that. My only question is, is it consistent with the kind of mandate that is contained in the ISTEA legislation?

Mr. TORRES. I think that it is. I think if we can utilize that as a by-product of enhancing and living up to the sections and the provisions of ISTEA, that it would be concurrent and consistent. I believe it would be.

Mr. PRICE. What kind of role for the States and programs on the part of individual States does this bill envision?

Mr. TORRES. I would again use my own State, California, as the prototype in that it would provide for the tire industry, if you will, the recycling industry, and the paving industry, a much more cost-effective and environmentally sound process to go about the business of paving our highways.

Mr. PRICE. Thank you very much.

Thank you, Mr. Chairman.

Mr. CARR. Thank you.

I would just like to, I guess, correct the record with regard to my comments about metal in the——

Mr. TORRES. Discarded tires?

Mr. CARR. In the discarded tires. Apparently my staff just pointed to some research that indicates that crumb rubber has the fiber and the metal removed, but then again, that is part of the cost of getting it ready for use. There may be a rubber connection with the microwaving process, I have no idea. But I do know that there was a metal problem in that process, and I had falsely assumed that perhaps there would be a metal problem resulting from tires, and apparently there is none. So I want to step up to the bat with the notion that I wasn't accurate, and I want to be accurate.

CALTRANS EXPERIENCE WITH CRUMB RUBBER

I have had a chance to read the entire statement by the California Department of Transportation, and while it says that California could comply with the 5 percent, requirement for the year 1994, it understands that other States may not have the same confidence in doing so, because they haven't had the experience, and they also understand that other States may seek relief from Section 1038 of ISTEA.

It also points to the need for more research on whether these is a threat to human health and the environment associated with the production and use of crumb rubber and whether the pavement that contains recycled crumb rubber can then be recycled. Caltrans is developing plans to address these issues by recycling some of the rubber that they have laid down to see what happens. And in their statement, and I quote, "considerable additional research, as identified in ISTEA, will still be needed to completely understand the advantages and disadvantages of the material."

So the Caltrans testimony that we will include in the record is not a ringing endorsement of this technology at this time. Would you agree?

Mr. TORRES. Yes, to some degree, Mr. Chairman. I think, though, the salient issue here was perhaps made by you earlier in stating that Los Angeles County does have an ongoing, very good program in terms of resurfacing, using this methodology.

MANDATED USE OF RECYCLED RUBBER

Mr. CARR. Now, given these uncertainties, and we haven't heard from the other witnesses who I think are going to be pointing out some concerns that are similar to California, and if California is the best case, with all due deference to our friends on the Public Works Committee who are mandating that in all States, all over the country, that 5 percent of their asphalt pavement contain recycled rubber for the year 1994. Given what apparently its most enthusiastic backer, Caltrans, believes, and given the fact that there are costs associated with using this material without a showing that its benefits are equally applied throughout the country, wouldn't it be prudent for this Committee to consider attempting to modify that 5 percent requirement and to give the States some additional time to get the benefit of the FHWA/EPA study to be completed in June, and get that confidence and experience?

Mr. TORRES. I am not sure, Mr. Chairman. As you are well aware, just about every program where we seek to make improvements in technology and enhancing the quality of life in our country oftentimes meets with resistance. And these mandates that as legislators we impose upon systems in trying to enhance that quality sometimes will meet with rigid resistance from industry, from the community, from many sectors.

I see that resistance with all of my recycling legislation, not only on scrap tires but on used motor oil or newsprint. These are all products which require market incentives enhance their utilization otherwise these items are being discarded, being wasted. We are depleting forests or we are depleting valuable oil assets by not recycling. We meet resistance on these areas, and it is the same with tires.

And I would think that a 5 percent mandated figure is not excessive, but rather something that is reasonable, something that would meet the challenge, would meet what I tend to believe are the requirements for our country to take advantage of this type of technology and save our resources. So that, yes, I am sure there will be some that will say it should be 2 percent or 3 percent, but I think 5 percent is not unreasonable.

Mr. CARR. I thank you for being here today. I appreciate it.

Mr. Torres. Thank you, Mr. Carr. Thank you for the subcommittee.

Wednesday, May 12, 1993.

CRUMB RUBBER MODIFIED ASPHALT

FIRST PANEL OF WITNESSES

ROBERT M. THOMPSON, PRESIDENT, THOMPSON-McCULLY COMPANY AND PAST CHAIRMAN OF THE BOARD, NATIONAL ASPHALT PAVEMENT ASSOCIATION

ROBERT A. WELKE, CHIEF ENGINEER AND DEPUTY DIRECTOR, BUREAU OF HIGHWAYS, MICHIGAN DEPARTMENT OF TRANSPORTATION

TIM BAKER, CHAIRMAN OF THE BOARD, RUBBER PAVEMENTS ASSOCIATION

FRANCIS B. FRANCOIS, EXECUTIVE DIRECTOR, AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

DAMIAN KULASH, EXECUTIVE DIRECTOR, STRATEGIC HIGHWAY RESEARCH PROGRAM

Introduction of First Panel

Mr. Carr. Next we are going to hear from a panel of witnesses. From my own State of Michigan and my good friend, Bob Thompson, President of Thompson-McCully, and also past Chairman of the Board, National Asphalt Pavement Association. Also from my State, Bob Welke, Deputy Director of the Bureau of Highways, Michigan Department of Transportation. Also, Mr. Timothy Baker, Chairman of the Board of the Rubber Pavements Association. And Mr. Frank Francois, executive director of AASHTO, a good friend of this Committee; and Damian Kulash, Executive Director of the Strategic Highway Research Program.

Would you gentlemen take seats at the witness table?

Statement of Robert Thompson

Mr. Carr. Mr. Thompson, why don't you begin.

Mr. Thompson. Thank you, Mr. Chairman.

First I would like to say when you walked in late, I was afraid to death you were going to say you are made late by an asphalt paver.

As you formerly state, I am past Chairman of the National Asphalt Pavement Association. I am also father of two children at work in the asphalt business. NAPA, the National Asphalt Paving Association, is an 800-member contract organization that represents contractors throughout the United States. The asphalt paving industry employs over 300,000 people, and as I said before, I have two children that work in the business.

I bring you a problem this morning, but in good keeping with all the management techniques I have been taught, I also bring you one suggested solution. The problem, of course, is Section 1038 of the ISTEA bill, and simply stated, the solution is a study that I hope you will undertake, and our best information tells us it is about a three-year study and would cost about $3 million.

Let me explain how I understand 1038 of the ISTEA bill. It mandates all Federally funded asphalt paving will have 5 percent incorporated 20 pounds per ton of recycled tires. That goes up 5 percent per year until 1997 and beyond. All Federally funded asphalt will have 20 percent, 20 percent of all Federally funded asphalt will have 20 pounds per ton of recycled tire incorporated in each ton.

We in Michigan and other States have done some of this work over the years, and we have some costs on this, and if you extrapolate those costs up, simply taking today's costs, no inflation or other increased costs, it rounds out to about a billion dollars in 1997 and beyond. And, of course, we will have some inflation.

The other factor that I think hopefully we can take into account is that there is a large usage of tires that are used for Btu purposes in power plants and kilns. In fact, last year there was about 57 million tires. Of course, there are about 230 million tires created each year, and that doesn't take care of the problem.

But, in fact, if this trend continues, and tires become a commodity, at some point we will be buying tires away from power plants who will use them for Btu purposes, and in effect we will be buying them out at coal prices. So this billion dollar number probably will go up.

Wisconsin and one of the eastern States, their stockpiles, reserves of tires are gone. They are not creating tires in their State for the power plant and kiln needs, and they are importing tires.

A billion dollars is a lot of money and most of us don't even realize how much that is. But let me tell you that a billion dollars compared to the health costs may be insignificant.

I am sure we have all been around where tires or rubber has been burnt. We know the noxious odor and we have seen the smoke. That is created somewhat when we put that in asphalt. We take this up to about 350 degrees and incorporate the tires in there, and that creates those kinds of smells.

When you recycle, in our normal recycling processes, the recycled rubber, asphalt will hit the virgin asphalt at about a thousand degrees, so we are going to create more noxious odors. I am not here to try to tell you, because I am not qualified to tell you, what those health problems might be.

But if in fact we do create health problems in our workers, emphysema, rashes, or worse, tumors or cancer, a billion dollars, if the roads-take the worst scenario. Say we spend the billion dollars a year and the roads fall apart on us, that will be an significant number compared to the health costs of our employees.

So, again, I ask you to fund up a study and take some time and look at this.

Let me just give you an analogy in closing. A couple of years ago I tried to open up a gravel pit in an urban area, and as you all know gravel pits are not popular at best. So the neighbors got an attorney and took us to court and a wise old judge said to me, after we had presented our side and they had presented their side, he said, Bob, there is harm and there is irreparable harm. And you go in there and open that gravel pit and you make a cavity and you disturb the groundwater, and you pollute the air, that is harm that we can't stand.

He said, So I want you to go out and do a study; I want you to give me a restoration plan and do some groundwater work and give us an air quality program. And he said, I know that is going to cost you money to do that and it is going to take time, and it is probably going to cause some harm because it is going to cost more money for your paving and you are going to try to pass that on to your customers and so forth, but that is harm. If I let you go in there and open up this gravel pit and make a cavity that is unacceptable and do groundwater damage and water damage, that is irreparable harm.

So what I am asking of you today is to consider a study that will cost some money; $3 million is a lot of money, and three years is a lot of time, and I am not asking to do with this recycling—if that is the proper and appropriate way to do it, I have got no problem—our company to do that. But I am asking you, for 300,000 people, take the time, do the harm, cost the money, because it will cost some harm to delay this. There will be some tires stacked up, there are some patent holders and other people who want to get on with this issue, and they will be set aside. So I am asking you today, do harm, not irreparable harm.

Mr. Carr. Well, we don't want to do harm of any kind.

[The prepared statement and biography of Robert Thompson follows:]

TESTIMONY OF
ROBERT M. THOMPSON
PAST CHAIRMAN, NATIONAL ASPHALT PAVEMENT ASSOCIATION

PRESENTED TO THE
TRANSPORTATION APPROPRIATIONS SUBCOMMITTEE
MAY 12, 1993

Mr. Chairman, my name is Robert M. Thompson. I am a highway contractor from Belleville, Michigan, and immediate Past Chairman of the National Asphalt Pavement Association (NAPA). Accompanying me is Richard Morgan, Vice President of NAPA. We commend the Subcommittee for holding these hearings and appreciate the opportunity to present our views on Section 1038 of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA).

NAPA is the national trade association exclusively representing the Hot Mix Asphalt (HMA) Industry. We have a membership of nearly 800 corporations, most of which are HMA producers and paving contractors. The majority of our members are small businesses and our member firms produce approximately 70 to 75 percent of the total HMA produced in the United States annually.

Our industry has some serious concerns about the implementation of Section 1038, "Use of Recycled Paving Material." Section 1038 requires, among other things, that a certain percentage of HMA tonnage constructed with Federal-aid funds contain crumb rubber from scrap tires. These minimum utilization requirements are that 5 percent of the Federal-aid HMA tonnage in 1994, 10 percent in 1995, 15 percent in 1996, and 20 percent in 1997, contain crumb rubber modifier (CRM). Failure to comply results in the loss of Federal-aid highway funds.

Section 1038 further requires that the USDOT and EPA conduct a study on the health and environmental impact, recyclability, and performance of asphalt rubber. There is also a provision that the Secretary of Transportation can waive the minimum utilization requirements for a three-year period under certain conditions:

- The use of asphalt rubber poses threats to human health or the environment greater than conventional HMA.

- Asphalt rubber can't be recycled to the same degree as conventional HMA.

- Asphalt rubber pavements do not perform adequately as a material for the construction or surfacing of highways and roads.

The Secretary is to consider the results of the study mentioned above in determining whether a waiver is appropriate. A report is to be submitted to Congress within 18 months after passage of the Act (or June 18, 1993). Unfortunately, the report will not provide definitive answers as there is little existing information available on these issues.

Our concerns are the lack of knowledge of the health and environmental effects and engineering properties of rubber modified asphalt as well as the high cost of the product. We strongly urge that a comprehensive research effort be undertaken and that adequate funds be provided in the Federal Highway Administration (FHWA) part of the DOT appropriation to carry out this research. Some background on this issue to support our request follows.

THE TECHNOLOGY

The use of ground rubber in HMA is not new technology, and has been in somewhat limited use for over 20 years. It has not received wide acceptance by highway agencies.

Two basic methodologies used to incorporate crumb rubber modifier (CRM) derived from scrap tires into HMA pavements are the wet and dry processes. The wet process describes a method that adds CRM to the liquid asphalt cement and blends the mixture prior to the manufacturing of HMA. The dry process basically includes the addition of the CRM directly into the HMA manufacturing process as an aggregate substitute. Certain of the wet and dry processes are covered by patents, although in recent years several non-patented processes are being tried by the states and industry.

Probably the best known wet process is the MacDonald process which was originated in Arizona and is covered by some eleven patents in all. These patents have been and are being enforced through litigation by the current patent owner. At least two of the patents expired in 1992 and according to our information, the latest patent will expire in 1996. The holders of these patents were active during the last session of Congress in seeking an extension of the patents through an Act of Congress. They were not successful, but we anticipate another effort will be made during this session of Congress. I realize that patent extensions are not within the purview of this Subcommittee; however, I did want to bring this matter to your attention as another part of this entire issue. If the patents were legislatively extended and the mandates of Section 1038 survive, the patent holders would have an ever-increasing exclusive share of the Federal-aid HMA tonnage at a great cost to the American taxpayer.

The use of asphalt rubber has been shown to be technically feasible and we, in the HMA Industry, can produce the product. No doubt we will have to buy additional equipment or make modifications to our existing facilities and that will be expensive. Other than the patented processes, there is little information available on how to design the mix, how to produce it, how to lay it, and test methods. Further, the health and environmental effects, recyclability, performance, and cost effectiveness have not been thoroughly researched. We, in the Industry, strongly feel that all of these questions should be definitively answered before we are forced to go to considerable expense to modify our existing facilities to incorporate this material.

COST IMPACTS

The American Association of State Highway and Transportation Officials (AASHTO), in analyzing the results of a recent survey of all the states on asphalt rubber, estimates that by 1997, at full implementation of Section 1038, the additional costs will be approximately $1 billion per year, or 5 percent of the Federal-aid authorization. That is $1 billion which won't be available for other needed highway construction. This is attributed to the costs of adding 20 pounds of CRM per ton of HMA constructed with Federal-aid funds. The 20 pounds per ton is a fairly typical mixture for CRM modified asphalt.

Here's another way of looking at cost effectiveness:

* An average passenger car tire weighs about 20 pounds. Approximately 50 to 60 percent of the tire is usable as CRM.

* At 20 pounds per ton, that's two tires per ton of HMA.

* Rubber modified asphalt costs between 50 and 100 percent more than conventional HMA.

* HMA costs about $30 per ton. Using the more conservative 50 percent increase, rubber modified asphalt costs $45--or $15 more per ton.

* That's $7.50 per tire to dispose of them in HMA. That still leaves somewhere around 40 to 50 percent of the tire that can't be used in HMA to be otherwise disposed of.

This clearly is not the most cost effective way to solve the scrap tire problem, unless these increased costs are offset by increased performance. Referring to the aforementioned AASHTO survey, most states believe that this will not be the case.

PERFORMANCE

Crumb rubber is an asphalt modifier of which there are literally hundreds. It may or may not enhance performance in certain applications. If certain states have success with it, they should continue to use it based on engineering and economics, the same as the many other modifiers that are on the market. As a solution to the scrap tire problem, it just doesn't make any sense economically.

As a performance enhancer in HMA, it should be left up to each individual state, but, again from an economic standpoint, there's absolutely no definitive information which would lead to the conclusion that it is worth the added cost; at least not at this point in time.

We have seen reports and correspondence indicating that California Pavement Design Guidelines allow reduced pavement thickness - up to 1/2 - when asphalt pavement with recycled rubber is used in place of conventional asphalt pavement. One could be led to believe that this was a general across-the-board pavement design guide. In fact, it's an interim guide and it applies to a specific type of mix, gap-graded asphalt rubber hot mix. Further, it applies to rehabilitation of distressed asphalt pavements and the thickness design is based on the rubber modified asphalt's resistance to reflective cracking rather than increased structural strength. The CALTRANS interim design guide is largely based on their experience with a project in Ravendale, California, and they are continuing research on rubber asphalt. We are not aware of any other state which has picked up this design guide because of the relatively limited applications and the limited research behind it. Neither CALTRANS nor FHWA has ever promoted this design application for anything other than what it was, and we in no way intend any criticism of the guide as issued. It does reinforce our position that states be permitted to determine the surface type and the asphalt mix which best suits their needs based on cost effectiveness and engineering judgement. What works in one climate or specific traffic loading situation won't necessarily work in another climate and under other traffic loadings. It should be strictly a state determination based on their experience and knowledge.

HEALTH AND ENVIRONMENTAL IMPACTS

Most HMA facility owners have gone to considerable expense to control the emissions from conventional HMA in order to meet Clean Air Act or state air control emission standards. I speak from personal experience. Recently, at one of my HMA production sites, I replaced an older facility with a modern one. It took me over one year and $1 million dollars to get the necessary permits and the facility up and operating.

With the addition of CRM to an HMA mixture, mixing has to take place at a higher temperature than conventional HMA. We do not know what the impact of this addition of CRM and mixing at a higher temperature will have on emissions. We may well have to have our facilities re-permitted. According to the AASHTO survey mentioned above, the Texas Air Control Board has stopped issuing permits for facilities producing asphalt rubber until it can be shown that CRM will not harm the environment or adjacent property inhabitants. In our state (Michigan) we understand that the Department of Natural Resources has taken a like position. There has to be more research done before use of asphalt rubber becomes mandatory and widespread.

The question is similar with regard to asphalt fumes and its potential impact on workers. For the past several years representatives of the industry have been in negotiation with federal officials on permissible exposure levels for asphalt fumes. The industry has conducted studies that show worker exposure to asphalt fumes from conventional HMA does not pose a significant problem. However, the use of CRM introduces a concern that worker exposure may be more severe because of the chemicals contained in tires and the higher temperatures necessitated. There have been few studies on this issue with the result that there is no definitive answer to the question. On a recent NAPA-sponsored study of worker exposure on a wet process project in California, the researchers note in the report:

> "The fume generated by the paving activities was reported to be dense and light-brown to gray in color, especially in the immediate vicinity of the paving equipment. The industrial hygienist reported that, relative to previous exposure monitoring studies performed at paving sites using standard asphalt hot mix materials, the degree of fume generation during paving using the asphalt/rubber hot mix materials appeared to be significantly greater."

Attached as Exhibit A are the conclusions from that report. This study was not designed nor intended to be definitive, but we believe it points out that further research and exposure assessments need to be conducted on this material.

Perhaps this best can be summed up by quoting the concluding paragraphs from the March 1993 status report by the Scrap Tire Application Committee of the Ontario, Canada Ministry of Transportation:

> "3. Scrap tire-based new product applications must not only submit to a technical feasibility study, but also undergo a rigorous cost analysis. It is feared that indiscriminate funding of new product applications will stifle the development of value-added product applications."
>
> "4. The development of new product applications must be accompanied by appropriate environmental and toxicological assessments. Collection of environmental data, such as leachates and emissions without doing a comprehensive environmental impact assessment is considered inadequate. Where large-scale applications, such as paving with rubber-modified asphalts are involved, long-term impact assessments are a must."

In a letter dated December 24, 1992, NAPA petitioned the USDOT and EPA to defer implementation of the minimum utilization requirements until the required research has been completed. The main basis of the petition is the potential increased health threat to our Industry workers because of the unknown constituents of the fumes from asphalt rubber. As mentioned above, Section 1038 of ISTEA does require a study to be submitted to Congress this June. Unfortunately, this study will contain little more than the results of a literature search of existing information. In our opinion, this is inadequate because limited information is available on this subject. The FHWA and EPA had planned to begin a comprehensive research effort this year to develop definitive answers to the issues posed in the legislation. We now understand that EPA does not intend to undertake further research on the health and environmental effects.

We have received a response to our petition from EPA indicating they could not concur in any delay. In conversation with FHWA, we understand that they will have a problem with our request. The reason is apparently because the legislation as written, requires that it has to be demonstrated that asphalt rubber poses a greater threat to health or the environment; is not as recyclable; or doesn't perform as well as conventional HMA. It is a comparison test and there isn't solid scientific data available to make a determination one way or another.

RECYCLABILITY

Conventional asphalt pavement is completely recyclable. Our industry and the states were recycling asphalt pavement materials since the 70's, before it became fashionable. Recycling of HMA pavements came about not because of any statutory requirements, but because it conserved natural resources, saved landfill space, and made economic sense. There were research and recycling demonstration projects done by FHWA, the states and Industry back in the early 70's. Recycling became accepted only after the research and demonstration projects indicated that the recycled mix could be adequately controlled through the entire process from production through laydown and that it would serve its intended function. This is probably a classic case of recycling which has received very little publicity. It has become routine and approximately 30 million tons are recycled every year. Millions of tons of landfill, millions of dollars, and millions of tons of liquid asphalt and aggregate have been saved because of this.

We don't know whether the addition of rubber to HMA, even in small amounts, will have an adverse impact on the recyclability of HMA. The engineering, health and environmental effects should be examined. If the addition of 20 pounds of crumb rubber to one ton of HMA renders it not recyclable, then we are exchanging a 20 pound problem for a 2,000 pound problem. This makes no sense at all. It's just another question that must be answered expeditiously.

THE HMA INDUSTRY AND INNOVATION

The HMA Industry is not wedded to the status quo nor do we resist change. One of our goals is to improve the quality of our product so that it does provide high-performing pavements for the traveling public. We don't resist change, but we welcome it and want to be a part of it. As mentioned above, we were pioneers in recycling. We have recently worked with the states and FHWA in developing the European technology, Stone Matrix Asphalt, for use in the United States. In fact, Mr. Chairman, you will recall you participated in one of our first projects in Michigan incorporating this new technology. Since then, many other states have tried it with success.

Our Industry was instrumental in founding the National Center for Asphalt Technology (NCAT) at Auburn University. The Industry, through voluntary contributions, created an endowment fund to establish this center in 1986. NCAT is independent of NAPA and is governed by a Board of Directors made up of representatives of the Industry, the research community and AASHTO. The purpose of NCAT is to develop new standards, publish and maintain newly acquired knowledge for the betterment of the Industry and apply that knowledge to practical use.

We have strongly supported and endorsed the Strategic Highway Research Program (SHRP) over the years. A NAPA member has been on Executive Committee which guides and governs that research since SHRP was established in 1987.

I mention these things, Mr. Chairman, to emphasize that we support and want to be a part of innovation along with our partners, the state and federal government. Before any new technology is put into general use, it must be thoroughly researched to ensure that the intended end results will be achievable and that the product is not harmful in its current use or in the future.

ALTERNATIVES

Attached as part of this testimony is Exhibit B, the Executive Summary of the recently published "Scrap Tire Utilization Technologies" report. Copies of the report have been furnished to this Subcommittee. The report uses engineering feasibility and economic analysis to evaluate various technologies for the use of scrap tires. It also considers potential environmental implications. It clearly points out that there are much more cost-effective and environmentally benign ways to solve the scrap tire problem than Section 1038 of ISTEA.

SOLUTIONS

NAPA submitted testimony to the April 21, 1993, hearing before the Subcommittee on Surface Transportation of the House Committee on Public Works and Transportation. In that testimony, we urged that Section 1038(d) of ISTEA be amended to allow flexibility in the minimum utilization requirements. The minimum utilization requirements should be expanded to uses other than in HMA. Use in bases, lightweight fills, retaining walls, shoulder stabilization, etc., should be permitted to fulfill the minimum utilization requirements. Further, use other than in Federal-aid work should be counted toward the minimum utilization requirements. If the goal is to get rid of scrap tires, and not to expand the market for asphalt rubber, it makes sense to provide the states with a range of options for solving the scrap tire problem.

We request that this Subcommittee include in the FHWA part of the DOT appropriations $3,000,000 out of the Highway Trust Fund, to remain available until expended, to carry out definitive basic research based on the studies required by Section 1038(b) of the ISTEA (PL 102-240). Further, the research should include on-site as well as laboratory research on the engineering properties, health and environmental effects, recyclability and performance of asphalt rubber. Mixture designs and procedures, construction techniques, specifications and quality tests should be products of this research. The Secretary, through the FHWA, should be required to enter into appropriate arrangements with the Transportation Research Board (TRB) to conduct a study of the benefits and costs of rubber modified asphalt pavements. The TRB should critique the research projects on this topic to be conducted by FHWA and other organizations, recommend redirection or supplements where appropriate, and develop a comprehensive assessment upon completion of the research. The FHWA should be given the authority to fund work done by and through other agencies and organizations with specific expertise on the topics to be researched. Such agencies include the EPA, Occupational Safety and Health Administration (OSHA), the National Institute of Occupational Safety and Health (NIOSH), and the National Cooperative Highway Research Program (NCHRP).

We further recommend that until this research is completed and submitted to Congress, the Secretary shall not have the states submit the certification required by Section 1038(d)(1) of PL 102-240. An alternative to this would be to waive the penalty of withholding apportionments from the states, as set forth in Section 1038(d)(4) until Congress approves the research results.

In these times of environmental sensitivity, economic uncertainty and tightly constrained spending, an approach such as we recommend is not out of order.

Mr. Chairman, we thank you for this opportunity to express our views.

EXHIBIT A

5.2 Conclusions

This study was designed as a pilot study to develop preliminary data on occupational exposures and fume content of chemicals potentially present in asphalt/rubber fume. The limited number of samples collected prevents a statistical evaluation of the data. The following conclusions are based upon observed trends in the data.

- Although the results of personal air sampling reveal no overexposures to Cal/OSHA regulated substances, the results of area air sampling demonstrate that the potential exists for worker overexposure to asphalt fume when working near the paving equipment.
- The results of the BSF analyses that was performed on the total particulate samples indicate that greater than 60% of the materials collected as total particulate from the screedman, paver operator, and paver area is an organic (benzene soluble) material. Further testing should be performed to determine the specific nature of this organic fraction.
- Observations made during this study indicate that paving operations using the asphalt/rubber material generates a denser asphalt fume than traditional asphalt materials. Further investigations should be performed to assess the relative degree of fume generation from these materials.
- Of the workers sampled during this pilot study, the screedman has the highest potential for exposures followed by paving operators and laborers.
- The results of tank headspace fume sampling suggest that PAH and SH concentrations are greater in the fume from the molten asphalt. These compounds may become tied up in the asphalt/rubber matrix. Volatile aromatic compounds, 1,3-butadiene and nitrosamines concentrations were greater in the fume from the asphalt/rubber tank. These chemicals may be released from the GTR materials.
- Several analytical variables may influence the quantitation of low and high molecular weight sulfur compounds. Additional method validation procedures should be performed to evaluate the accuracy and precision of this analytical method. Additional testing for 1,3-butadiene should be performed to quantify the exposure potential for this chemical.

SCRAP TIRE UTILIZATION TECHNOLOGIES

Executive Summary

The United States is faced with the seemingly daunting task of finding ways to dispose of the 285 million tires that are discarded each year and the estimated 2 to 3 billion tires currently stored in stockpiles. The problem has reached such a proportion that it has been addressed in legislative mandates.

To assist those responsible for assessing available options and finding solutions, the enclosed *Scrap Tire Utilization Technologies* report has been published to provide a comparison of the current uses that have the potential for substantially reducing the scrap tire problem. This report uses engineering feasibility and economic analysis to evaluate each technology and also considers the potential environmental implications.

The analysis found that:

1) Scrap tires can be an efficient, economical and environmentally-benign energy resource (tire-derived-fuel or TDF). They are being successfully used as supplemental or primary fuel in cement kilns, pulp/paper mills, electric utilities, pyrolysis units and dedicated tires-to-energy facilities. Last year, 57 million scrap tires were used by these industries. The potential TDF usage within five years is predicted to be 230 million scrap tires.

   As a fuel source, scrap tires can provide the following benefits:
   - generate greater Btus per pound than some conventional fuels
   - are cheaper per Btu than many other fuels
   - can generate income

- when compared to traditional fuel sources, have the same or lessor environmental impact on air quality
- are completely consumed in the burning process
- preserve natural resources and decrease dependence on imported oils

2) Scrap tires are being successfully used in such civil engineering applications as lightweight embankments, drainage layers, slope stabilization and retaining walls. A detailed review of highway construction projects in six states found whole and shredded scrap tires can be equal to or superior than traditional materials, and are often available at substantial cost savings.

In civil engineering applications, scrap tires have the following advantages:

- preparation requires minimal or no energy consumption
- are a lightweight fill material
- replace more expensive or scarce aggregate
- have high permeability characteristics
- are resistent to ultraviolet radiation
- provide improved thermal characteristics relative to frost penetration
- are cost effective

3) Scrap tires are being used as an additive to asphalt in road pavements. While the addition of scrap-tire rubber to asphalt has proven to be technically feasible, it has not proven to be cost beneficial. There are other concerns regarding the use of crumb rubber in asphalt including its unknown impact on the environment and on the health of the work force when used in this application.

The issues surrounding rubber modified asphalt include:

- modifier uses only 50 to 60 percent of scrap tire
- production requires increased energy consumption
- modifier increases cost of an asphalt pavement by more than 50 percent with no proven equivalent life performance benefit

- uncertainty over recyclability of the material
- unknown effect of fumes on workers
- lack of national standards on mix design procedures and performance criteria

Comparison of the Scrap Tire Technologies

	Energy Resource	Civil Engineering	Crumb Rubber in Asphalt
-"cost" advantage per tire	+$ .15 to $1.26	-$ .20	-$7.50
-cost effectiveness	yes	yes*	unknown
-fume exposure to workers	none	none	unknown
-air emissions	same or less	none	unknown
-percentage of tire reused	75 - 100%	100%	50 - 60%
-engineering value	yes	yes	unknown
-conserves natural resources	yes	yes	no

*Depending on transportation costs, scrap tires are usually less than conventional materials.

The report concludes that there are economical uses for scrap tires, particularly as a fuel source, and uses with the potential for consuming large quantities of scrap tires. It suggests that an economic analysis be a major factor in determining the best solutions, and that incentives be used to promote scrap tire usage. It further recommends that air permitting regulations be standardized and the public be educated about the available technologies.

ROBERT M. THOMPSON

Robert M. Thompson, President, Thompson-McCully Company, Belleville, Michigan, served as Chairman of the National Asphalt Pavement Association (NAPA) in 1992. Mr. Thompson served as NAPA First Vice Chairman in 1991; as NAPA Second Vice Chairman in 1990; as Third Vice Chairman in 1989; as a member of the NAPA Executive Committee, 1988-1991; as Chairman of the Board of Directors of the National Center for Asphalt Technology (NCAT), 1988-1990; on the National Center for Asphalt Technology Board of Directors, 1988-1991; on the NAPA Education Foundation Board of Trustees, 1988-1991; as State Director, State of Michigan, NAPA Board of Directors, 1986-88; as Chairman, New Technology Task Force, 1984; and on the Recycling Committee, 1982.

A native of Michigan, Mr. Thompson is a graduate of Bowling Green University and served in the U.S. Air Force as a jet fighter pilot. He is a member and past-president of the Michigan Asphalt Paving Association and is a member of the Board of Directors of the Michigan Road Builders Association.

He has also served on the Board of Directors of Commercial Bank of Ann Arbor, Michigan, and is a member of the First United Methodist Church of Plymouth, Michigan.

STATEMENT OF ROBERT WELKE

Mr. CARR. Mr. Welke.

Mr. WELKE. Thank you, Mr. Chairman. I am Robert A. Welke, Chief Engineer and Deputy Director of the Bureau of Highways for the Michigan Department of Transportation, and I appreciate the opportunity to be here with you this morning.

I would like to mention in my 35 years of highway engineering experience, I spent nearly eight years as bituminous engineer for the State of Michigan, which gave me an insight and knowledge into the chemical and physical aspects of bituminous mixtures in particular.

In my written testimony you will note I also include some work I did in 1978 on crumb rubber asphalt mixtures.

The Michigan Department of Transportation is certainly proud of its leadership role. We are committed to be a leader in the use of recycled materials and highway engineering application. MDOT strives to look for cost-effective products that improve our highway system and reduce waste stream, avoiding landfilling and/or use of disposable and renewable products.

We have had many successful recycling programs in Michigan, the most successful being our 1977 recycling of bituminous pavements. We estimate our recycling asphalt pavement, RAP, saves an estimated 525,000 tons of aggregate, 10,500 of asphalt cement, resulting in a net savings of between $3.5 to $4 million a year.

In addition, our efforts dispose of a million tons of old asphalt in the landfills. MDOT currently recycles existing concrete pavements, and this effort has resulted in savings similar to those generated in our bituminous program.

At this time we are researching the use of recycled waste plastics into guard rail posts, landscape timbers, and roadside delineator posts.

We believe these examples illustrate our commitment to and interest in utilizing soundly engineered recycled product to improve our highway system and provide public benefit.

I won't go into a lot of detail on the ISTEA requirements. I think that has been mentioned to some extent here already. But we are certainly concerned about some issues, looking ahead to 1994, and those issues are: the threat of human health and the environment associated with the problem and use of asphalt pavement containing recycled rubber; the degree to which asphalt paving contains recycled rubber can be recycled; and the performance of asphalt pavements containing recycled rubber under various climactic and use conditions.

Until these issues are scientifically researched, documented, and reported as acceptable to the environment and human health, and the issue of recyclability is resolved, MDOT urges a delay in mandates requiring the use of tire rubber and asphalt pavements.

In spite our department's ongoing efforts to research the issues at hand, we and other State DOTs are now facing the following mandatory use schedule for adding tire rubber to our asphalt medication tours: 5 percent in 1994, 10 percent in 1995, 15 percent in 1996, and 20 percent in 1997, each year thereon.

I would like to make a quick analogy. If you take just 10 percent of the 4 million tons of mixtures we place, that becomes 400,000 tons. That relates, depending on how thick, to well over a hundred miles a roll. If we have premature failure in that 100 miles a roll, I can assure you the public wrath will fall on my shoulders.

As you will note from our materials submitted for review, on May 7th, MDOT has conducted a great deal of research with various types of rubber modified asphalt mixtures, and the cost appears to exceed the benefits for several reasons.

The cost per ton for crumb rubber asphalt is nearly double that of the conventional hot asphalt mixes. It appears crumb rubber pavements are not recyclable. There are no standard methods or designing and testing rubber modified mixtures. Air quality tests have only looked at particulate matter and not fumes or total emissions.

The tire industry uses many different chemical combinations in designing and constructing the auto tire. Accurate data may require that each tire be tested in terms of potential health hazards to the workers.

Since the effect of air quality is unknown, MDOT must work under special permits through the D&R in order to develop our experimental test beds. We have had a committee since 1992, the Michigan Department of Natural Resources and the Michigan Department of Commerce to work on this with a goal of trying to solve these issues.

We have received a temporary permit to the Department of Natural Resources for 1993 to allow to us do an experimental project where not only will we measure the physical benefits, we will also measure the worker exposure. We are very concerned about that.

The D&R has made it very, very clear to us, until these questions are fully answered, until we meet all the clean air and health requirements, particularly those of EPA, this will only be a temporary permit for one project. In my written testimony I define that project in detail.

In addition to that, we are going to take 1,500 tons of bituminous pavement that we placed in 1978 on M–46, mill it up, bring it down and attempt to recycle it to the best possible equipment and technologies we know today, and try to measure both the particulate, the chemical and fume aspects, particularly in the case of worker exposure. So we are making that effort in trying to find out.

My point of all this, Mr. Chairman, is, we feel a little bit like we are being whipsawed. We have one law telling us that in 1994 we may have to do something. We have another, our D&R telling us that might be fine, but we have this other law that says you can't do anything that might be hazardous to the health or to the environment. And 1994 is not very far away.

In our business, we plan two, three, four, five years ahead. We have to scope out our projects several years ahead to determine the monies and schedule. And when you start changing scopes and projects, you get everybody in the industry upset with you. I assure you of that.

We need field studies that will evaluate total particulates-benzene organics, polynuclear aromatic hydrocarbons. These and other possible fumes need to be determined for maximum limits for exposures set by the Occupational Safety and Health Administration. Some are known cancer-causing agents. We are very concerned about this, and certainly our people in the Michigan D&R are also.

In addition, we have been working with several other alternatives for the use of scrap rubber to help utilize and try to eliminate the stream of waste products such as light-weight filler on embankments.

Based on some of the things I mentioned here this morning, I suggest that Congress support the States through the Federal Highway Administration by funding the needed chemical, physical and environmental research needed for information on rubber modified asphalt.

The Secretary of Transportation, in concurrence with the Administrator of the Environmental Protection Agency, issued a waiver of the mandated 1994 implementation date for States' use of rubber modified asphalt for Federally funded projects: until the questions raised concerning performance, recyclability, environmental and health hazard concerns are properly resolved, that ISTEA be amended to allow flexibility in the use of scrap tires, in highway applications, and allow the DOTs to determine the most potential beneficial use.

Again, Mr. Chairman, I appreciate the opportunity to address this committee. I would be happy to answer any questions you may have based on my written submission to the committee.

Thank you.

[The prepared statement and biography of Robert Welke follow:]

Testimony on Section 1038
# of the
Intermodal Surface And Transportation Efficiency Act of 1991
Regarding the
"Asphalt Pavement Containing Recycled Rubber Demonstration Program"

MICHIGAN
DEPARTMENT OF TRANSPORTATION

Robert A. Welke
Chief Engineer and Deputy Director
Bureau of Highways
May 12, 1993

Good morning Mr. Chairman and members of the Subcommittee. My name is Bob Welke. I am currently Chief Engineer and Deputy Director of the Bureau of Highways for the Michigan Department of Transportation. My background in highway construction and bituminous paving includes 14 years as a Construction Project Engineer, 8 years as Statewide Bituminous Engineer and 2 years as District Construction Engineer/Senior District Engineer in Michigan.

The Michigan Department of Transportation commends you, Mr. Chairman, for holding these hearings on the issue of crumb rubber use in asphalt pavements as mandated by Section 1038 of the Intermodal Surface Transportation Efficiency Act of 1991. I also appreciate the opportunity to present Michigan's views on the issues involved.

OVERVIEW

The Michigan Department of Transportation has always strived to be a leader in the use of recycled materials in highway engineering applications. Our interests are driven by a desire to increase the use of cost-effective products that improve our highway systems and to reduce the waste stream in our society, avoiding landfilling or useless disposal of renewable resources.

One of our biggest successes to date is in the recycling of bituminous paving mixtures, which we began in 1977. This resource recovery effort has developed to the point where in a typical year the department's recycled asphalt pavement (RAP) program saves an estimated 525,000 tons of aggregate and 10,500 tons of asphalt cement, resulting in a savings of between 3.5 to 4.5 million dollars. In addition to the dollar savings, we avoid the necessity of disposing of some 1 million tons of old asphalt pavement per year.

Our efforts to recycle existing concrete pavements has resulted in similar savings. We currently allow recycled crushed concrete pavement to be used as coarse aggregate for Portland Cement Concrete in the construction of curbs, gutters, sidewalks, barriers, driveways and temporary pavements. Early uses of crushed concrete for mainline pavements in some of Michigan's trial jobs resulted in some serious cracking and associated faulting problems, so this use has been discontinued until an acceptable engineering solution can be found. We also allow the use of crushed concrete as aggregate for bituminous concrete, bituminous seal coats, dense-graded base courses, and open-graded drainage courses when the crushed concrete is coated with either cement or asphalt.

The department has had extensive success in allowing the use of fly ash, a coal burning waste by-product, as a cement substitute in Portland Cement Concrete and in flowable fill mixtures. We also allow the use of fly ash as a mineral filler in hot-mix asphalt pavements. At present the Michigan Department of Transportation has formed a public/private partnership with Michigan utility companies and the U.S. Ash Company to further develop cost-effective uses for fly ash.

At present, we are also researching the use of recycled waste plastics into guardrail posts, landscape timbers and roadside delineator posts.

These efforts to utilize recycled waste products in a soundly engineered manner, serve to underscore our department's commitment to the overall recycling objective. We have always been supportive of recycling efforts that offer a benefit to the public and improve the highway system.

ISTEA REQUIREMENTS FOR USE OF RECYCLED TIRE RUBBER IN ASPHALT PAVING MIXTURES

Section 1038 of the Intermodal Surface Transportation and Efficiency Act of 1991, sets forth a mandatory program for the inclusion of ground tire rubber in asphalt paving mixtures. This requirement proposes the utilization of ground tire rubber through one of several processes now commercially available. The Michigan Department of Transportation began experimental projects with these processes in 1977 and our experience to date will be summarized later.

Several features of Section 1038 are of serious concern to our department. First is the requirement written therein that "the Secretary (of Transportation) and the Administrator of the Environmental Protection Agency shall coordinate and conduct, in cooperation with the states, a study to determine:

A. the threat of human health and the environment associated with the problem and use of asphalt pavement containing recycled rubber;
B. the degree to which asphalt pavement containing recycled rubber can be recycled; and
C. the performance of the asphalt pavement containing recycled rubber under various climate and use conditions."

To our knowledge, this study phase has not been conducted. No reports on these three critical issues have been generated by the Secretary of Transportation or EPA. It is our understanding that a report on a comprehensive literature review is forthcoming on these issues. We do not believe this will clarify the questions raised by the mandated study issues of Section 1038 just mentioned, since we have also reviewed the available literature which leaves the critical operational questions unanswered. Until these issues are properly researched and reported as acceptable to the environment and to human health and the recyclability issue is resolved, use of tire rubber in asphalt pavements should not be mandated.

In spite of our department's ongoing efforts to research the issues at hand, we and the other state DOTs are now facing the following mandatory use schedule for adding tire rubber to our asphalt paving mixtures as listed in Section 1038(d):

5 percent for the year 1994
10 percent for the year 1995
15 percent for the year 1996
20 percent for the year 1997, and each year thereafter.

These requirements are expressed as a percentage of the total tons of asphalt laid in each state and financed in whole or part by any assistance pursuant to Title 23, United States Code. Michigan places a total of approximately 4 million tons of asphalt pavement per year that will fall under this federally funded mandate. We estimate that compliance with the requirement will cost us as much as an additional $100 million over the 1994 to 1997 period if the patented processes for utilization of tire rubber in asphalt must be used. (There are some unpatented processes for addition of the rubber to asphalt mixtures that are still being evaluated which would be nearly as expensive.) This cost is over and above the cost for placing a conventional asphalt paving mixture. Non-compliance with this provision would result in an estimated loss in revenue of $250 million to the State of Michigan over the 1994 to 1997 period. A funding reduction of this magnitude is unacceptable. With the unknown environmental, human health, performance and recyclability concerns that we are still facing, you can understand the seriousness of the department's reservations with full implementation of the Section 1038 requirements in 1994. However, unless relief is granted we will spend the additional $100 million (more or less) to preserve the $250 million in federal aid to the state, even though our information to date indicates it may not be technically feasible to do so.

Under ISTEA Section 1038(d)(5), the Secretary of Transportation is granted the option of setting aside the provisions of the subsection for any three year period if, in concurrence with the Administrator of the Environmental Protection Agency, they decide that the three points to be addressed above are not adequately resolved. It certainly appears from the state perspective that such a waiver should be instituted at this time until all the questions on environmental impact, human health concerns, performance and recyclability are adequately resolved. It will be contrary to the public trust to proceed with the scheduled 1994 implementation date and ignore all the current indications that serious problems and unresolved issues still exist with the use of tire rubber in asphalt paving mixtures.

PROCESS DESCRIPTION FOR RUBBER MODIFIED ASPHALT

The Michigan Department of Transportation has constructed trial asphalt paving jobs using both of the major processes for adding tire rubber to asphalt paving mixtures. In both cases, tire rubber is finely ground to produce a product called crumb rubber modifier (CRM). When this CRM is added directly to the aggregates used in producing an asphalt mixture, it is referred to as the "dry process". When the CRM is preblended with the liquid asphalt cement before it is introduced into the asphalt mixing drum, it is referred to as the "wet process". The resulting mixtures are both referred to as rubber modified asphalt (RMA). In all of our trial projects, RMA has been produced through the hot mixing process and carried out by experienced asphalt paving contractors.

MICHIGAN'S RESEARCH EXPERIENCE

The following summary documents the Michigan Department of Transportation's trial projects using crumb rubber modifier in both the dry and wet processes to produce rubber modified asphalt mixtures.

1977 Project in Saginaw County, Route M-46

In 1977, the department constructed, on an experimental basis, several bituminous pavement sections using two mixing procedures similar to what are now called the wet and dry processes. The methods differed from those of the patented processes; rubber granule sizes and amounts were different and no blending enhancers were used. These sections were carefully designed by our engineering staff working along with technical representatives of the asphalt-rubber industry. Some of the asphalt-rubber sections performed nearly as well as conventional paving mixtures, but most sections had to be replaced prematurely due to rapid surface disintegration that required extensive and frequent patching.

Control sections were paved on the same project using a standard bituminous mixture and have shown the normal amount of distress. They are expected to perform adequately for several more years. The asphalt-rubber sections experienced slightly less rutting and equivalent reflective cracking, but they exhibited more severe surface disintegration, especially in the dry process sections. Hence, based on this project the additional cost of the rubber modified mixtures (approximately three times the standard mixture) does not appear to be warranted by increased life or performance of the pavement.

1990 and 1991 Projects, M-60 in Cass County and M-22 in Leelanau County

In recent construction seasons (1990-1991), the Michigan Department of Transportation placed more than 2,000 tons of rubber modified asphalt pavement using the wet process (patented at the time and also known as the Arizona process) on M-60 in Cass County and on M-22 near Traverse City. Both paving projects involved the latest technologies developed by the asphalt-rubber production industry. They are now being monitored for long-term performance in comparison with standard bituminous control mixtures placed. The asphalt-rubber paving material was more than three times the cost of comparative conventional mixtures ($68/ton vs $22/ton), even though we used the latest blending technology from the asphalt-rubber industry.

MDOT is now performing a thorough evaluation of the two experimental pavements and a final report will be available when the study is completed in a few years. Performance evaluation measurements thus far show no differences between the asphalt-rubber and the conventional bituminous pavements on these two projects.

1993 Proposed Project, M-50 in Eaton County

In order to better address the environmental and human health questions concerning the effects of producing rubber modified asphalts and the recyclability of bituminous mixtures containing tire rubber, the department will be conducting another experimental project during the 1993 construction season.

The main objectives of this project are to; 1) evaluate the recyclability of rubber modified asphalt mixtures; 2) to measure the emissions to the environment from the asphalt plant producing rubber modified asphalt mixes; and 3) to assess exposure hazards to the workers involved in producing and placing these types of mixtures. This project will use both the wet and dry processes (unpatented versions) for producing the rubber modified asphalt.

To evaluate the recyclability of a rubber modified asphalt pavement, about 1500 tons of bituminous paving mixtures containing ground tire rubber will be milled from the 1977 M-46 project in Saginaw County and will be recycled and placed on M-50 in Eaton County. Emissions will be measured at the asphalt plant along with monitoring the fumes at the work site. Standard hot mix asphalt mixtures, virgin rubber modified asphalt mixtures, and five different mixtures with varying quantities of recycled material will be produced. Separate emission and exposure measurements will be conducted for each mixture. Field performance and laboratory evaluations will be done on all mixtures.

Results of this study will hopefully provide basic data on the types and quantities of emissions and fumes generated during the production and paving of mixtures made with virgin materials, recycled asphalt pavement (RAP), crumb rubber, and recycled crumb rubber. These data are almost totally lacking at this time and are essential to the successful implementation of the ISTEA Section 1038 mandatory use requirements, scheduled to begin in 1994.

This project is being conducted in cooperation with the Michigan Department of Natural Resources (MDNR), who has issued an experimental air quality operating permit limited to this project only. As the enforcement arm of the EPA in Michigan, the MDNR will not concur on issuance of future permits for producing crumb rubber modified asphalt until they have reviewed the data and the results of this study. Without their concurrence and approval, future projects using crumb rubber modified or recycled crumb rubber modified will not be possible in Michigan. It can be anticipated that this permitting process by MDNR/EPA will significantly delay the contract lettings of the 1994 bituminous paving program.

EXPERIENCE REPORTED BY OTHERS ON RUBBER MODIFIED ASPHALT

Many states have experimented with crumb rubber in hot mix asphalt, some have met with success and others have met with failure. In a recent survey conducted by the Maryland Environmental Service (in which 41 states responded), it was noted that over 490 miles of state highways (nationwide) have been paved with crumb rubber modified asphalt. Of the states responding, the reported cost per ton for conventional hot mix asphalt was $20 to $40, and the cost per ton of crumb rubber modified hot mix asphalt was $50 to $70. Only 13 percent of the states considered the crumb rubber projects to be cost-effective at this time.

The states using the process most frequently are Arizona, California and Florida. These states reported having good results. In other states, there were more failures than successes. For example, the Texas Department of Transportation reported it paved seven projects, four showed considerable premature distress and two had to be reconstructed. The increased cost for materials along with the high possibility of failure has limited the number of projects being tried in other states. This variable success amongst the states underscores Michigan's concern for the experimental nature of rubber modified asphalt at this time and the serious lack of any standardized methods for designing or testing rubber modified mixtures.

Although there have been a number of projects constructed with crumb rubber in hot mix asphalt, there is limited experience in the area of recycling these pavement sections. Even in the states that have used the process on a frequent basis, no recycling of rubber modified asphalt has been done to date. This is a very important issue that must be investigated and answered before proceeding with a nationwide use mandate. Many states recycle asphalt mixtures and the percentage at which this recycling occurs has been increasing. If this trend is not allowed to continue because crumb rubber modified asphalt pavements are non-recyclable, we will have another, larger landfill problem. One tire generates about 12 lbs of crumb rubber since only the tread and part of the sidewall can be used. Hence, only 40 to 60 percent (by weight) of the scrap tire is utilized, the remainder still needing disposal. At full implementation of ISTEA Section 1038, we will be required to use 20 lbs of crumb rubber per ton (2000 lbs) of mix. When these rubber modified asphalt pavements are themselves replaced in the future, each ton of asphalt pavement may require sanitary waste disposal because of the 20 pounds of tire rubber it contains. This would be a 100 fold increase in our current waste disposal problem with scrap tires, which would certainly be counterproductive to the objective of the scrap rubber utilization objective. This prospect is particularly troublesome to the Michigan Department of Transportation in view of the fact that we currently recycle 1 million tons of asphalt pavement per year.

A major concern of many state DOTs and environmental agencies is the air quality effects of producing hot-mixed rubber modified asphalt mixtures. The states that have performed air quality testing have only looked at particulate matter, not the fumes or total emissions. These emissions are not only of concern environmentally, but also create significant concern for worker health and safety. The Providence of Ontario did a limited air monitoring study in 1991 which indicated that there may not be an environmental problem. However, the study had too many variables involved and no conclusive findings were made. Michigan, California, Florida, Louisiana, New Jersey, Texas and North Carolina all plan to begin some type of environmental (asphalt plant discharge stack emissions) and health hazard (worker exposure) testing in 1993. The generation of this type of data is an example of exactly what must be accomplished before wide use of crumb rubber modified asphalts can be implemented. The unknown factors in this particular program must be made known before proceeding, which is an issue of particular concern to us. To proceed with full implementation of ISTEA Section 1038 in 1994 as scheduled, will force wide scale use without a complete understanding of the environmental and worker safety issues.

UNRESOLVED ISSUES IMPEDING IMPLEMENTATION OF ISTEA SECTION 1038

The following issues summarize the unresolved questions that remain concerning the use of rubber modified asphalt mixtures. Until all these questions are resolved, the state DOTs will not be able to comply with the mandatory requirements of Section 1038 in a well-engineered, environmentally sound and worker safe manner.

PERFORMANCE

Experience to date by the Michigan Department of Transportation and others, reports that the rubber modified asphalt mixtures longrange performance has not been determined. In many instances, premature deterioration and/or failure of the rubber modified asphalt have been reported. In either case, the lack of evidence for improved performance at the increased cost precludes the use of rubber modified asphalt as a well-engineered option. Michigan's experience has been for the rubber modified asphalt to cost up to three times that of the standard control mixture. Other states report a 50 to 100 percent increase in cost. These cost and performance data certainly appear to make the rubber modified asphalt a poor choice for recycling discarded tire rubber. Other proven engineering uses are available and will be noted later.

Relating to performance, it is also worthy to note that no standardized methods have been introduced to or approved by the industry for the testing of rubber modified asphalt mixtures. A test method is not even in existence to our knowledge which will verify the presence and uniformity of the specified dosage of crumb rubber modifier (typically 20 lbs per 2000 lbs of asphalt mixture), thus making job control and mix verification testing very difficult, if not impossible. Without such a test, the states cannot verify that they are actually getting the rubber content in the asphalt mixtures for which they are paying.

RECYCLABILITY OF RUBBER MODIFIED ASPHALT PAVEMENTS

There is almost a total lack of information on the ability to recycle a rubber modified asphalt pavement. If this proves to be unfeasible in the future for reasons of environmental contamination, worker exposure problems to hazardous fumes, costly controls required on the asphalt plants or performance problems, the intent to reduce the waste stream by recycling tire rubber into asphalt would be sabotaged. By adding 20 lbs of crumb rubber modifier to 2000 lbs of an asphalt mixture, if the resulting pavement is rendered unrecyclable, the waste stream is increased by 100 fold! At the present, virtually 100 percent of Michigan's existing asphalt pavements are recycled when they are removed totaling approximately 1 millon tons per year. The burden of disposal of asphalt mixtures that could not be recycled would be great and very costly. We have developed an excellent recycling program to reuse our asphalt pavements and there is futility and misfortune in aborting one successful program for one which has yet to be engineered.

ENVIRONMENTAL CONCERNS

Very limited data exist on the environmental impacts of producing rubber modified asphalt in a typical hot-mix asphalt plant. Ever tightening air quality standards in the states, motivated by the Federal Clean Air Act, prohibit any increase in the emissions of particulates or volatile organic solids, etc., to the atmosphere. The Michigan Department of Transportation has scheduled a 1993 trial project to measure these emissions on all the pertinent variations of rubber modified asphalt and recycled RMA pavement mixtures. This is being done under a special experimental permit issued by the Michigan Department of Natural Resources. The testing involved is very sophisticated and expensive (estimated at $350,000 for this single project involving 30,815 tons of asphalt mixtures which includes 144 tons of new and 1500 tons of recycled, rubber modified asphalt). Pending the results of this project, the Michigan Department of Natural Resources as an agent of the Federal EPA, will not consent to further issuance of the necessary air quality permits for 1994 projects. This in essence ties our hands for the letting of 1994 projects using crumb rubber modifier as mandated by ISTEA, Section 1038.

WORKER HEALTH HAZARD CONCERNS

In conjunction with the unknown environmental emissions evolving in the production of rubber modified asphalt, are concerns about the exposure of the asphalt workers to hazardous fumes. The main concerns that remain to be evaluated in actual field production include total particulates, benzene soluble organics, and polynuclear aromatic hydrocarbons. These and other possible fume constituents have maximum limits for exposure set by the Occupation Safety and Health Administration, some being known cancer causing agents. To further compound this problem, it should be noted that tire rubber is produced by the myriad of manufacturers and is not itself a homogeneous material. Different manufacturers use different chemicals in the process, any one of which could result in unique problems or health hazards in the recycling into the asphalt process. The 1993 trial project to be done by the Michigan Department of Transportation includes a health hazard fume study, but will in no way survey all the various polymerized rubber types from various tire manufacturers that will be included in rubber modified asphalt mixtures when ISTEA Section 1038 is implemented in 1994.

SUPPLY OF CRUMB RUBBER MODIFIER

The Michigan Department of Transportation shares a concern voiced by other state DOTs regarding the availability of the crumb rubber modifier if ISTEA Section 1038 mandate begins in 1994. The economics of producing the crumb rubber by fine grinding tires is such that the supply is not there at the present time, since the demand is not there either. Many states consume practically their total supply of scrap tires through alternate uses such as burning in power production plants. If the supply cannot meet demand when projects throughout the country mandate the use of crumb rubber modifier, the few existing producers will command a monopoly on the market, which will greatly escalate costs and delay projects. This will benefit no one except the few who control the market.

CONSIDERATION OF ALTERNATE USES OF SCRAP TIRE RUBBER

Several state DOTs have reported other engineering uses for scrap tires and ground tire rubber that have proven to be reliable and cost-effective. These are summarized as follows:

Lightweight Fill and Embankment

Oregon, Vermont, Minnesota and Washington DOTs have reported on the successful use of either whole tires or shredded tire rubber as lightweight fill for repairing slopes, filling over swamps and peat bogs, or stabilizing banks from erosion. Since tire rubber is an inert material at normal temperatures, this utilization offers much promise. Minnesota has measured the water quality passing through such ground rubber fills and reports no environmental contaminants detected. This alternate use has proven effective and offers the potential for utilizing a far greater amount of tire rubber than could ever be utilized in asphalt paving mixtures.

Drainage Course Under Pavements

California and Vermont DOTs report the successful use of a two-inch layer of shredded tire rubber placed under a pavement to provide a drainage course to remove water. This use was also successful in consuming large amounts of tire rubber in a well-engineered application and introduces no contaminants to the environment.

Slope Stability and Retaining Walls

California and North Carolina DOTs report the successful use of whole scrap tires in constructing earth filled retaining walls and in stabilizing slopes along banks and ditches against erosion. These uses proved to be 1/2 to 1/3 the cost of conventional methods of building such walls or slope stabilizers. Again the application offers the potential for consuming large numbers of scrap tires in a very well-engineered and environmentally acceptable manner.

RECOMMENDATIONS

The Michigan Department of Transportation makes the following recommendations based on our experience and findings to date concerning the mandated use of crumb rubber modifier to produce rubber modified asphalt, scheduled for implementation in 1994:

A. Congress should support the states through FHWA by the funding of the needed chemical, physical and environmental research needed on rubber modified asphalt and the publishing of all known testing information.

B. The Secretary of Transportation, in concurrence with the Administrator of the

Environmental Protection Agency, should issue a waiver of the mandated 1994 implementation date for the states' use of rubber modified asphalt for federally funded projects until the questions raised concerning performance, recyclability, environmental and health hazard concerns are properly resolved.

C. The legislation of ISTEA should be amended to allow the state DOTs flexibility in the utilization of a specified yearly quota of scrap tire rubber that includes all potentially beneficial highway applications. Many such applications have already been successfully demonstrated by various states in a well engineered and environmentally sound manner, far exceeding the known experience with rubber modified asphalt.

SUMMARY

Mr. Chairman, on behalf of the Michigan Department of Transportation I again commend you for holding these important hearings. The issues I have reviewed are of great concern to us relative to the use of crumb rubber made from scrap tires in asphalt paving mixtures. It is imperative at this time that Congress evaluate these issues in relation to the provisions of section 1038 of the Intermodal Surface Transportation and Efficiency Act of 1991.

Thank you for the opportunity to present this testimony.

ROBERT A WELKE

Robert A. Welke was born in Detroit, Michigan, graduating from the University of Detroit in 1958 with a BSCE. He is a Registered Professional Engineer with 35 years of experience in many phases in highway design, construction and administration with the Michigan Department of Transportation. For seven years, Mr. Welke was Supervising Engineer of the Bituminous Unit in the Testing and Research Division. He is a member of several professional organizations, including the American Association of State Highway and Transportation Officials, Association of Asphalt Paving Technologies, and the American Public Works Association. Mr. Welke has published several articles and reports dealing with recycling and pavements. He has made presentations at many highway conference in the United States and Canada.

From June of 1983 to December of 1984, Mr. Welke was the Senior District Engineer and District Construction Engineer for the Kalamazoo District, which covers nine counties in southwest Michigan. He is presently Deputy Director of the Bureau of Highways. He manages a staff of 3,000 employees and a budget of $1 billion.

STATEMENT OF TIMOTHY BAKER

Mr. CARR. Thank you.

Our next witness will be Mr. Timothy Baker, Chairman of the Board, Rubber Pavements Association.

Is there a reason you are sitting way down at the other end of the table?

Mr. BAKER. I feel like I am a good Notre Dame fan traveling to the football game.

Mr. CARR. You have a real strike against you.

Mr. BAKER. So I might as well just leave.

Mr. CARR. I wouldn't have put that on my resume. It is all friendly fun. We are glad you are here.

Mr. BAKER. Thank you.

I am here today to discuss with Members of this subcommittee technologies which use crumb rubber to build better roads.

I appear before you today as Chairman of the Board of the Directors of the Rubber Pavements Association. This association is comprised of companies which produce asphalt rubber containing recycled rubber, companies which produce the crumb rubber for uses in asphalt pavements, and companies which for these two industries.

In addition to serving as Chairman of this association, I am President of Baker Rubber, a producer of crumb rubber for uses in asphalt pavement and other products. Baker Rubber was established in 1934 and currently employs 150 people at plants in South Bend, Indiana, Chambersburg, Pennsylvania, and Mesa, Arizona.

In addition to uses of rubber being used in asphalt pavements, ground rubber is used in the manufacture of molded rubber products, blended rubber and plastic products, auto and truck tires and various other products.

It is interesting to note that tens of millions of tires manufactured each year in the U.S. contain 2 to 10 percent of similar crumb rubber with similar quality control requirements as the crumb rubber that goes into our highways.

During the past 20 years, over 40 States have to various degrees used crumb rubber modifiers. For these States with the most experience, the use of these materials has typically grown. States like California and Arizona use crumb rubber modifiers as standard procedure in a variety of applications.

Crumb rubber is now being used in crack sealants, stress-absorbing membranes, and hot-mix applications. I have seen these products in use across the United States. These products, if properly engineered and properly placed, perform extremely well.

Mr. Chairman, use of these technologies has not been driven by the need to dispose of scrap tires. Crumb rubber modifies and enhances asphalt pavements.

The Federal Highway Administration has classified crumb rubber as a modifier, not as an additive. There are two primary processes which crumb rubber has used to modify asphalt. They are the wet or the dry process.

Section 1038 of ISTEA encourages States to use crumb rubber modifiers. The legislation requires the EPA and FHWA to analyze data and conduct research on the performance, the effects on health and environment, and the recyclability of asphalt pavements containing crumb rubber.

The U.S. EPA, FHWA, State highway departments and the private sector have been researching these technologies for over 20 years. Under Section 1038, the EPA and the FHWA are required to collect and analyze data, to report to Congress by June 18th, 1993, on any negative performance, emission or recyclability characteristics of these technologies. Absent findings of negative characteristics, a statement immunization requirement will automatically be implemented in 1994.

Based on our view of extensive research conducted on these technologies, we firmly believe these products are safe, recyclable and cost effective. I will not use my time before the committee this morning to address each of these items.

Under Section 1038, the EPA is charged with analyzing existing data to determine if the existing negative—if there are emission characteristics of crumb rubber. I ask you and urge to you listen to their testimony closely, because they will be reporting that the data that they have gathered includes seven reports, and that this data shows no difference between asphalt on rubber modified pavements and conventional asphalt pavements. We are not here to defend asphalt, but we are here to compare asphalt rubber to conventional paving materials.

Section 1038 requires the data on recyclability of asphalt pavements containing recycled rubber be collected and analyzed by the FHWA. There exist two definitive studies, including both the wet and dry process, showing that they can be successfully recycled. One study was conducted by the New Jersey Department of Transportation. The second study was conducted by the Beugnet Group in France. Copies have been provided to the committee.

As a matter of fact, the New Jersey recyclability project was presented an innovative pavement design award by the New Jersey Asphalt Pavement Association just recently in early 1993.

Regarding performance, members of our association have demonstrated that these technologies make longer-lasting, lower maintenance roads. The use of crumb rubber in asphalt pavements retards reflective cracking, reduces the propensity for rutting, reduces surface noise, retards the aging process, and increases pavement flexibility. Research reports substantiating each of these claims has been provided to this committee.

In addition to these positive characteristics, the extent of research on the use of crumb rubber has led some States to reduce pavement thicknesses by as much as one-half. The engineering value of reducing thicknesses is substantiated in a project conducted at the University of Alaska, which has already been provided to the committee.

As any emerging technology, however, there exists a learning curve for those dedicated to performing the technology. Later this morning will you hear from Dr. John Epps of the University of Nevada, a gentleman who I have the highest regard for. Dr. Epps has conducted extensive research on the use of rubber in pavements.

The University of Nevada recently teamed with the U.S. Army Corps of Engineers and with our industry to conduct research on construction productivity with asphalt rubber. This two-year joint study, a copy of which has been made available to the committee, concludes that these products, if properly applied, age more slowly and are more resilient than conventional asphalt alternatives. In short, Mr. Chairman, they last longer.

In conclusion, regarding performance, Mr. Chairman, we look forward to receiving the FHWA June 18th report to Congress to confirm our position on performance of these pavements.

Cost is perhaps the least understood and the most controversial aspect of these technologies. I will show you today the true current costs of asphalt pavements containing recycled rubber and the true costs of implementing minimum utilization requirements in 1994.

Assuming the material is used in non-engineering applications, and there are no performance benefits derived from the use of this technology, it will cost $30 million for the crumb rubber material necessary to meet the minimum utilization requirement in 1994.

The total cost of raw material is offset in several ways. The first offset is the alternative cost of landfilling the 17 million scrap tires which will be used in modifying asphalt pavements in 1994. The actual alternative landfill cost is $18 million, slightly more than a dollar a tire.

We do not recommend the non-engineering nonperformance approach to incorporating ground rubber into asphalt. We recommend a value-added approach that will lead to better performing pavements and with reduced lift thicknesses, lower front-end cost.

AASHTO recently conducted a State survey which claims that the cost of implementing Section 1038 will be a billion dollars by 1997. This is a nice anecdotal figure, Mr. Chairman, but it is absolutely wrong.

The AASHTO survey is based on a series of faulty, flawed assumptions and cost information. AASHTO's primary assumption was based on extrapolating outdated cost information.

In the last two years, the cost of crumb rubber modifiers has decreased by up to 50 percent. AASHTO's survey does not reflect this cost reduction. This cost reduction is a function of larger projects, overall larger markets, increased productivity and an increase in competition. These costs likely will decrease further in 1994 due to economies of scale.

Neither does the AASHTO survey calculate up-front cost savings associated with reduced lift thicknesses now used in several States. Attached to my testimony is a document comparing actual project bids conducted during late 1992 in California. Immediate cost savings have been shown through using crumb rubber modifiers and pavements at reduced thicknesses.

When calculating improved pavement longevity and reduced maintenance, we can show significant life-cycle cost savings associated with the use of these technologies. We have provided this committee an analysis showing these life-cycle cost savings.

The question may be asked whether there is sufficient capacity in the crumb rubber industry to provide new raw materials as stable prices to asphalt contractors. The answer to that question is a resounding yes.

On the positive side, the AASHTO State survey shows that Federal encouragement to use these technologies is already working.

Sixty percent of all States are positioned to meet the 1994 minimum utilization requirement. Federal funded projects using these technologies have increased by 300 percent in 1993 over 1992. And 90 percent of the States request that AASHTO develop guide specs for use in these products.

Regarding patents later this morning, which is a sensitive issue, you will hear from Carl Jacobson, International Surfacing, co-owner of the asphalt rubber patents. Our position on patents is identical to the language on patents contained in ISTEA: Patented and unpatented products should be treated equally.

There exists significant competition to ensure fair prices and market delivery. That has been reflected in the reduction in pricing on asphalt rubber over the last two years.

In closing, I would like to express publicly our association's disappointment over NAPA and AASHTO's reaction to congressional efforts to encourage greater use of this technology. NAPA and AASHTO have worked hand in hand to distribute inaccurate and misleading information about these technologies to representatives of the conventional asphalt paving industry, State highway officials, Congress and the general public.

The unfair AASHTO cost analysis and the NAPA health worker safety allegations have worked to discourage public acceptance of these products at exactly the time when greater acceptance is necessary.

I have high personal regard for NAPA's immediate past Chairman, Bob Thompson, and with all the individual paving contractors with whom I have been associated with the last 20 years. I believe I understand the source of NAPA's resistance to Section 1038. They are not convinced that the engineering merits of this technology, which is partly the fault of the proponents of these technologies, and they are reacting based on the belief that we are working to dispose of waste in our nation's asphalt pavements, their back yards.

Nonetheless, NAPA members such as Rubber Pavements Association member Jed Billings of F&F Construction in Arizona, have chosen to disregard NAPA's misinformation. F&F Construction has become a major player in the crumb rubber modified market in the Southwest.

To a large measure, the role of the industry is to influence Section 1038 and this demonstrates that the provision is already working. Likewise, I have worked extensively and closely with many State highway departments. I believe I understand the source of their resistance to Section 1038. No one likes to be told what to do and how to do it.

In my experience, the States have shown varying responses to legislative encouragement to use these technologies. Extreme examples of those are Florida and New York. Florida has developed a program for incorporating rubber in asphalt that adds little or no value to the pavement.

An example of cooperation has recently unfolded in Texas. During 1992, the DOT formed four hot-mix projects, which developed various degrees of distress. As a result of this experience, the State, in cooperation with our industry, has rewritten its asphalt rubber hot-mix design specifications, and during the first quarter of

1993, set up 24 workshops on crumb rubber modifiers in all highway districts.

Because of these activities, Texas has now positioned itself to take advantage of the improved performance characteristics of crumb rubber modified materials.

At this time, I would like to challenge NAPA and AASHTO to redirect all of their resources that they are devoting to discouraging use of these technologies to encouraging the use of these technologies. Both NAPA and AASHTO had the capacity to provide training and technical assistance to their members to help them meet the requirements of Section 1038. The Rubber Pavements Association also offers its resources to work directly with NAPA and AASHTO to accomplish these goals.

I challenge this committee as well, Mr. Chairman, to facilitate the sharing of information on these technologies. We are asking for your cooperation and support. We are asking for your help to use crumb rubber modifiers to build better roads.

Thank you for this opportunity. I would be pleased to answer any questions.

[The prepared statement of Timothy Baker follows:]

TESTIMONY OF TIMOTHY A. BAKER

CHAIRMAN, RUBBER PAVEMENTS ASSOCIATION

PRESIDENT, BAKER RUBBER, INC.

BEFORE THE

HOUSE APPROPRIATIONS SUBCOMMITTEE ON TRANSPORTATION

MAY 12, 1993

I. INTRODUCTION

Thank you, Chairman Carr, for providing me with the chance to be represented at this hearing today. I am here today to discuss with Members of this Subcommittee technologies which use crumb rubber to build better roads.

I appear before you today as Chairman of the Board of Directors of the Rubber Pavements Association. This Association is comprised of companies which produce asphalt pavements containing recycled rubber, companies which produce crumb rubber for use in asphalt pavements, and companies which support these two industries.

In addition to serving as Chairman of this Association, I am President of Baker Rubber, a producer of crumb rubber for use in asphalt pavements and other products. Established in 1934, Baker Rubber currently employs 150 people at plants in South Bend, Indiana; Chambersburg, Pennsylvania; and Mesa, Arizona.

In addition to use in asphalt pavements, ground rubber is used in the manufacture of molded rubber products, blended rubber and plastic products, athletic surfaces, brake linings and brake pads, automobile and truck tires and a variety of other products. It is interesting to note that tens of millions of tires manufactured in the U.S. contain from 2% to 10% of similar crumb with similar quality control requirements as the crumb rubber going into our highways.

During the past twenty years, over 40 states have, to varying degrees, used crumb rubber modifiers. For those states with the most experience, the use of these materials has typically grown. States like California and Arizona use crumb rubber modifier as standard procedure in a variety of applications. Crumb rubber is now being used in crack sealants, stress absorbing membrane inner-layers and hot mix asphalt applications. I have seen these products in use across the United States. These products, if properly engineered and properly placed, perform well.

Mr. Chairman, use of these technologies has not been driven by the need to dispose of scrap tires. Crumb rubber "modifies" and enhances asphalt pavements. In most instances, rubber is being recycled, not disposed of, in asphalt pavements. The Federal Highway Administration (FHWA) has classified crumb rubber as a "modifier," not as an "additive".

There are two primary processes by which crumb rubber is used to modify asphalt pavements. They are the "wet" or pre-reacted process, and the "dry" process. The "wet" process uses crumb rubber to change the properties of asphalt binder. The "wet" process uses 300 to 400 pounds of crumb rubber per ton of binder which is used as crack sealant, as stress-absorbing membrane inner-layers or in hot mix asphalt. In hot mix asphalt, total crumb rubber volume is from 20 to 40 pounds per ton of pavement. The "wet" process is often called "Asphalt Rubber."

The "dry" process uses approximately 60 pounds of crumb rubber per ton of hot mix asphalt. In the "dry" process the crumb rubber is added to the aggregate mix. The "dry" process is often referred to as "rubber-modified asphalt" and the most widely used product is marketed under the name PlusRide[1]. There are variations to the dry process that have lesser percentages of rubber and different rubber gradations.

Section 1038 of the 1991 Intermodal Surface Transportation and Efficiency Act (ISTEA P.L. 102-240), encourages states to use asphalt pavements containing recycled rubber from scrap tires. The legislation requires the United States Environmental Agency (USEPA) and the FHWA to analyze data and conduct research on the performance, the effects on health and the environment, and the recyclability of asphalt pavements containing crumb rubber.

The USEPA, FHWA, state highway departments and the private sector have been researching these technologies for over twenty years. Under Section 1038, the USEPA and the FHWA are required to collect and analyze data and to report to Congress by June 18, 1993 on any negative performance, emissions or recyclability characteristics of these technologies. Absent findings of negative characteristics, a state minimum utilization requirement will automatically be implemented beginning in 1994.

Based on our review of the extensive research conducted on these technologies, we firmly believe that there exist no negative emissions, recyclability or performance characteristics of asphalt pavements containing crumb rubber. We also believe that these products are highly cost-effective. I will use my time before this Committee this morning to address each of these issues.

II. EMISSIONS FROM CRUMB RUBBER MODIFIERS

Under Section 1038, the USEPA is responsible for analyzing existing data to determine if there exist negative emissions characteristics of asphalt pavements containing recycled rubber. The USEPA is working to evaluate the baseline data from numerous research reports on this topic. These reports include:

a) "Exposure of Paving Workers to Asphalt Emissions", by the Asphalt Rubber Producers Group (ARPG), 1991[2]

b) "Asphalt/Rubber Fume Pilot Study" prepared for NAPA, March, 1993 by the Radian Corporation[3]

c) "Air Pollutant Emissions Test, Asphalt Plant Baghouse Stack, San Antonio, Texas", July, 1992[4]

d) "Is Rubber-Modified-Asphalt Recyclable? NJDOT Funds Study"[5]

Based on independent review of the evidence in these reports, there is no difference in emissions between conventional asphalt pavements and asphalt pavements containing recycled rubber. We look forward to reviewing the June 18 EPA report to Congress which we expect will confirm our position on emissions.

Worker health safety is directly linked to emissions. Because emissions of asphalt pavements containing recycled rubber are the same or less as those of conventional asphalt pavements, there exist no worker health safety problems with use of these technologies unless there exist worker health safety problems associated with the use of conventional asphalt pavements.

On December 24, 1992 the National Asphalt Pavement Association (NAPA) submitted a letter[6] to then-USEPA Administrator William Reilly requesting that the minimum utilization requirement in Section 1038 be waived due to alleged worker health safety concerns. The Rubber Pavements Association submitted a subsequent letter[7] to the USEPA demonstrating that the NAPA worker health safety allegations were based on misleading and inaccurate information. On March 23, the USEPA responded to the NAPA allegations by denying their request for a waiver[8]. The March 23, 1993 USEPA response further demonstrates that there are no worker health safety problems associated with use of these products. This matter will be finally put to rest when the USEPA submits its June 18 report to Congress.

III. RECYCLABILITY OF CRUMB RUBBER MODIFIERS

Section 1038 requires that data on the recyclability of asphalt pavements containing recycled rubber be collected and analyzed by the FHWA. There exist two definitive studies concluding that both the "wet" and "dry" processes can be successfully recycled. One study was conducted by the state of New Jersey[9]. The second study was conducted by Beugnet Group, France.[10]

Additionally, asphalt rubber crack sealants and stress absorbing membrane inner-layers (300 to 400 pounds of crumb rubber per ton of asphalt) have been used throughout the United States for the past two decades. Over 40 states already use crumb rubber in their pavements through these processes alone. The inclusion of crumb rubber crack sealants and inner-layers has not negatively affected recyclability of asphalt pavements. Once again, the Rubber Pavements Association looks forward to reviewing FHWA's June 18 report to Congress which we are confident will conclude that asphalt pavements containing crumb rubber are fully recyclable.

IV. PERFORMANCE OF CRUMB RUBBER MODIFIERS

Regarding performance, members of the Rubber Pavements Association have demonstrated that these technologies make longer lasting, lower maintenance roads. The use of crumb rubber in asphalt pavements retards reflective cracking[11], reduces the propensity for rutting[12], reduces surface noise[13], retards the aging process, and increases pavement flexibility[14].

In addition to these positive characteristics, the use of crumb rubber in asphalt pavements has allowed some states to reduce pavement thicknesses by as much as one-half. Attached to my testimony is a copy of FHWA-approved design guidelines issued by the California Department of Transportation (CALTRANS)[15] which allows for reduced pavement lift thicknesses, with the same or better performance results, when crumb rubber is used to modify asphalt pavements.

The engineering merit of these reduced thickness guidelines has been challenged by opponents to greater use asphalt pavements containing recycled rubber. The engineering viability of reduced lift thicknesses is substantiated in a recent research project conducted by the University of Alaska[16]. The CALTRANS design guidelines were based on nearly fifteen years of independent research on these technologies. One of the most compelling reports came from a test project conducted by CALTRANS in the early 1980's in Ravendale, California. A copy of that study is also attached to my testimony.

Improved performance, however, has only been accomplished through commitment to change. As with any emerging technology, there exists a learning curve for those dedicated to perfecting the technology. As we have learned through the FHWA's Strategic Highway Research Program (SHRP), there are numerous factors which contribute to a successful asphalt pavement. These factors include mix design, asphalt quality, aggregate mix and many others.

Later this morning you will hear from Dr. John Epps of the University of Nevada Reno, a gentleman for whom I have the highest regard. Dr. Epps has conducted extensive research on the use of rubber in pavements. The University of Nevada, Reno teamed with the U.S. Army Corps of Engineers and with the Asphalt Rubber Producers Group to conduct research on construction productivity with "Asphalt Rubber". This two-year joint study, which cost approximately $400,000, has resulted in eight volumes of data. This study concludes that these products, if properly applied, age more slowly and are more resilient than conventional asphalt alternatives (copy enclosed). In short, Mr. Chairman, they last longer.

This level of success has not always been the case and while the learning curve moves forward, some crumb rubber projects have failed. Dr. Epps will, I'm sure, discuss with you today the conclusions of a "Synthesis" study. While we support and encourage John's fine work, our association takes exception to some of the conclusions that might be drawn from the "Synthesis" report.

In conclusion regarding performance, Mr. Chairman, we look forward to receiving the FHWA's June 18 report to Congress to confirm our position on this matter.

V. COST OF CRUMB RUBBER MODIFIERS

Cost is perhaps the least understood aspect of these technologies. I will show you today the true current cost of asphalt pavements containing recycled rubber and the true cost of implementing Section 1038.

Assuming the material is used in non- engineering applications and there are no performance benefits derived from the use of this technology, it will cost $120 million for the crumb rubber material necessary to meet the minimum utilization requirement when it is fully implemented in 1997. This translates to 800 million pounds of crumb rubber at $.15 per pound. There are twelve pounds of rubber per tire. The cost per tire for raw material is $1.80.

This total cost for raw materials is offset in several ways. The first offset is the alternative cost of land filling the 67 million scrap tires which will be used to modify asphalt pavements in 1997[17]. The actual alternative land filling cost is $72 million, slightly more than $1 per tire. This $72 million in savings will be realized by municipalities who will hopefully divert the savings from land filling to road construction. Using this offset, the net cost of Section 1038 when it is fully implemented in 1997 is $48 million nationally.

We do not recommend the non-engineering, non-performance approach to incorporating ground rubber into asphalt. We recommend a value added approach to using ground rubber in asphalt that will lead to better performing pavements and with certain applications, reduced lift thicknesses or engineering modifications that can result in lower front-end costs.

Attached to my testimony is a document comparing actual project bids conducted during 1992 in Southern California[18]. Immediate cost savings are shown through comparing actual bids of conventional mixes and asphalt pavements containing recycled rubber at reduced lift thicknesses.

When calculating improved pavement longevity and reduced maintenance we can show significant life cycle savings associated with full implementation of Section 1038. David Forrester, of T.I.R.E.S., Inc., based in Winston-Salem, North Carolina, has prepared a document for the Rubber Pavements Association showing these savings[19].

The American Association of State Highway Transportation Officials (AASHTO) recently conducted a "staff survey" which claims that the cost of implementing Section 1038 will be $1 billion dollars. This is a nice anecdotal figure, Mr. Chairman, but it is wrong.

The AASHTO "staff survey" is based on series of a fatally flawed assumptions and cost information. AASHTO's assumptions on the supply and cost of crumb rubber were used without the consultation of the Crumb Rubber Modifier industry. Assumptions were also based on extrapolating the cost per ton of small projects which were quoted last year.

Additionally, the price of "Asphalt Rubber" has decreased by 25% to 50% during the last 12 to 18 months. "AASHTO's Survey" does not reflect this cost reduction. This cost reduction is a function of larger projects, overall larger markets, increased productivity and increased competition.

The question has been asked whether there is sufficient capacity in the crumb rubber industry to provide raw materials at stable prices to asphalt contractors. The answer to that question is a resounding "yes," but the crumb rubber industry must invest in plant and equipment in order to meet expected demand. Again, we are looking forward to the June 18 report to Congress in order to plan for anticipated demand.

VI. OPPOSITION TO SECTION 1038

I would like to take a moment to discuss two documents related to Section 1038. The first document is NAPA's widely distributed "Scrap Tire Utilization Technologies Report". The second is the recent AASHTO State Survey. After reviewing NAPA's "Scrap Tire Utilization Technology Report", I find it difficult to understand why NAPA devotes less coverage to "Rubber Modified Asphalt" than to civil engineering applications or energy recovery. Maybe this is the main message NAPA is trying to convey?

The AASHTO state survey shows that federal encouragement to use these technologies is already working. Sixty percent of all states are geared up to meet the 1994 minimum utilization requirement. Federally funded projects using these technologies will increase by 300% in 1993 over 1992. 90% of States requested that AASHTO develop guide specifications for use of these products.

AASHTO recently wrote to Senator Max Baucus, Chairman of the Senate Committee on Environment and Public Works, requesting that Section 1038 be amended to allow states greater flexibility to use rubber in "potential transportation related" projects. Our Association has responded to AASHTO's letter stating Crumb Rubber Modifiers make better roads and that use of rubber in light weight fill is still considered "disposal" by the USEPA.

The Rubber Pavements Association does not oppose methods of disposing of crumb rubber or tire shred as light weight fill if those methods are proven to be environmentally sound. We encourage high-value end use recycling of crumb rubber, and the highest value for this recycled product is clearly demonstrated when it is used to modify asphalt pavements.

The Rubber Pavements Association has written Chairman Baucus opposing the AASHTO recommended amendment to Section 1038. We base our opposition on the flawed assumptions on which AASHTO based its request for legislative relief. A copy of our letter to Chairman Baucus is attached to my testimony[20].

VII. PATENTS

Later this morning you will hear from Carl Jacobson of International Surfacing Inc. Carl will speak about patents and other related issues pertaining to "Asphalt Rubber".

The Rubber Pavements Association's position on patents is identical to the language on patents contained in Section 1038 of ISTEA. Patented and unpatented products should be treated equally. The status of the patents on these products should have no bearing whatsoever on their intended use. There exists sufficient competition within and among processes to ensure fair prices and market delivery. Because of Section 1038, several companies with significant interest and resources have begun major programs to develop asphalt pavement products containing recycled tire rubber. This research and development likely will lead to the next generation of products that will further improve the performance of our road system.

VIII CONCLUSION

In closing I would like to express publicly our Association's disappointment over NAPA's and AASHTO's reaction to Congressional efforts to encourage greater use of these technologies.

NAPA and AASHTO have worked hand-in-hand to distribute inaccurate and misleading information about these technologies to representatives of the conventional asphalt paving industry, state highway officials, Congress and the general public. The unfair AASHTO cost analysis and the NAPA worker health safety allegations have served to discourage public acceptance of these products at exactly the time when greater acceptance is necessary.

I have high personal regard for NAPA's immediate past Chairman, Bob Thompson, who is with us here today, and with all of the individual pavement contractors with whom I've been associated over the past twenty years. I believe I understand the source of NAPA's resistance to Section 1038. They are not convinced of the engineering merits of these technologies, which is partly the fault of proponents of these technologies, and they are reacting based on the belief that we are working to dispose of solid waste in our nation's asphalt pavements, their "back yard."

Nevertheless, many NAPA members, such as Rubber Pavements Association member Jed Billings of FNF construction in Arizona, have chosen to disregard NAPA's politically-motivated information. FNF Construction has become a major player in the "Asphalt Rubber" market in Arizona and California. FNF's role in our industry is to a large measure the influence of Section 1038. Because of Section 1038 several asphalt contractors with significant interest and resources, like FNF Construction, have invested in learning how to use this technology. This progress demonstrates that Section 1038 is already working.

Likewise, I have worked extensively and closely with many state highway departments. I believe I understand the source of their resistance to Section 1038. No one likes to be told what to do.

States have had varying responses to legislative encouragements to use these technologies. Extremes include Florida and New York. The state of Florida, with Legislative and Executive Branch encouragement, has developed its own crumb rubber process which incorporates varying amounts of ground rubber per ton of asphalt pavement, depending on the application. The Florida state highway department did the necessary developmental work using NCAT, a widely accepted asphalt research center. They worked closely with the ground rubber industry, "Asphalt Rubber" paving industry and the Florida paving contractors to develop a program that will incorporate ground rubber in 100% of their asphalt surface courses beginning this fall. The process will not only consume 20% to 40% of the tires in a cost effective manor, it will extend the life of these pavements significantly. Florida will meet or exceed the requirements in Section 1038, as will Arizona, California, Texas, Kansas and other states. Attached to my testimony is information on the Florida process[21].

Conversely, New York State DoT, with similar Executive Branch encouragement, operating in a vacuum, developed a CRM specification that does nothing to improve the performance of the pavement. The State DoT showed a great deal of reluctance to work with the CRM industry as demonstrated by their end results.

An additional example of agency/industrial cooperation has just recently unfolded in Texas. During 1992 the Texas DoT performed four hot mix "Asphalt Rubber" projects. These projects experienced varying degrees of distress. As a result of this experience the State, in cooperation with our industry, has rewritten its "Asphalt Rubber" hot mix design specifications and during the first quarter of 1993 set up 24 workshops on CRM in all highway districts. "Asphalt Rubber" company representatives conducted these workshops. Because of these activities, Texas has now positioned itself to take advantage of the improved performance characteristics of CRM materials.

At this time, I would like to challenge the National Asphalt Pavements Association and the American Association of State Highway Transportation Officials to redirect all of the resources that they are devoting to discouraging use of these technologies to encouraging use of these technologies. Both NAPA and AASHTO have the capacity to provide training and technical assistance to their members to help them meet the requirements of Section 1038.

The Rubber Pavements Association offers its resources to work directly with NAPA and AASHTO to accomplish that goal: to help experienced contractors share information with less experienced contractors, to help experienced states share information with less experienced states.

I challenge this Committee as well, Mr. Chairman, to facilitate the sharing of information on these technologies. We are asking for your cooperation and support. We are asking for your help to use Crumb Rubber Modifiers to build better roads.

I would be pleased to answer your questions. Thank you for this opportunity.

END NOTES

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2 Exposure of Paving Workers to Asphalt Emissions (When using Asphalt-Rubber mixes). Grace Rinck and Dan Napier, C.I.H.

3 Asphalt/Rubber Fume Pilot Study (Final). Radian Corporation, Sacramento, 1993.

4 Air Pollutant Emissions Test, Asphalt Plant Baghouse Stack, Redland Stone Products Corporation. Environmental Analytical Services Division of Southwestern Laboratories, Inc. San Antonio, TX, 1992.

5 Is Rubber-Modified-Asphalt Recyclable? Newark, NJ. New Jersey Department of Transportation, 1992.

6 T. D. Larson 12/31/92 letter to Robert M. Thompson, with NAPA 12/24/92 letter to DoT and EPA.

7 Gordon MacDougall 3/17/92 letter to The Honorable Federico Pena, Secretary, DoT, with attachments.

8 Richard J. Guimond, USPHS letter to Robert M. Thompson, 3/23/93.

10 An Innovative Process for one site hot recycling of six years old open-graded mixes. Stephane Fourtier, SANEF and Alain Sainton, BEUGNET.

11 A Twenty Year Study of Asphalt-Rubber Pavements in the City of Phoenix, Arizona. Equbalai Charania, Joe O. Cano, Russell H. Schnormeier. Asphalt Rubber Producers Group.

12 Draining Mixes. Hugo VandeVelde. S.A. Esso, Belgium.

13 Noise Reduction with Asphalt Rubber. ARPG.

14 Permanent Deformation Characteristics of Recycled Rubber Modified and Unmodified Asphalt Concrete Mixtures. Keil C. Krutz and Mary Stroup-Gardner.

15 Earl Shirley, State of California 2/28/92 letter.

16 Remaining Fatigue Life Analysis: A Comparison Between Conventional Asphalt Concrete - Dense Graded (CAC-DG) and Asphalt-Rubber Hot Mix-Gap Graded (ARHM-GG). Lutfi Raad, Stephan Saboundjian, and John Corcoran. Paper for Transportation Research Board Meeting, WDC, 1993.

17 Yearly Cost of Implementation of Section 1038. Timothy A. Baker.

18 Cost Comparison: Asphalt-Rubber Strategies vs. Conventional Asphalt Concrete Strategies. Unknown author.

19 Cost Analysis Rubber-Modified Asphalt - A Reality Based Look. Rubber Pavements Association.

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STATEMENT OF FRANCIS B. FRANCOIS

Mr. CARR. Thank you, Mr. Baker.

We will get to some questions. First we want to hear from our good friends from AASHTO.

Frank, would you summarize?

Mr. FRANCOIS. I am Frank Francois, Executive Director of the American Association of State Highway and Transportation Officials. I am pleased to respond to your invitation to provide our views on Section 1038 of ISTEA.

We have provided a copy for the record of our backup documents. In this oral statement, I would like to summarize our member departments' experience thus far with the crumb rubber asphalt mandate of Section 1038, and describe some of the issues as we see them.

Section 1038 mandates we take rubber from scrap tires and put in hot-mix asphalt at percentages up to 20 percent for use in constructing highway pavements. This, of course, is not a new idea. The important question is, is it a good idea? Frankly, we believe that the jury is still out on this question.

Given that Section 1038 has sanctions attached for noncompliance, all States must consider how to respond to it. From our survey of the States, we find that they plan to use nearly four times the amount of crumb rubber modified hot-mix asphalt pavement in 1993 as they did last year. We have also found that the cost for crumb rubber modified hot-mix asphalt is commonly two times or more the cost of normal hot-mix asphalt.

Now, that information is not based on industry advocates' estimates, but on actual construction bid information. We let our data speak for itself because it is the real world.

While cost is an issue, crumb rubber modified hot-mix asphalt also is raising engineering, health and environmental questions among our highway engineers. We would like to have those questions answered. In the meantime, we would like to be allowed to dispose of scrap tires in other ways in our highway environment.

In order for States to use scrap tires for other civil engineering purposes in the highway environment, we need permission. We first turned to the U.S. DOT for that. They advised us they did not have the authority to grant our request and said it would take legislation.

We have now written to both authorizing committees asking them to take up our request. A copy of that letter has been given to you. In the meantime, the mandate clock of Section 1038 continues to tick.

There are a few States, Arizona and California in particular, that report some success in utilizing crumb rubber from scrap tires, rubber tires in hot-mix asphalt. Both of these States have been using it for years in some applications, with satisfactory results. Florida is now experimenting with the use of crumb rubber in processes that are outside the crumb rubber modified asphalt patents, and which show promise.

These few States aside, crumb rubber modified hot-mix asphalt is not now in routine use. Instead, nearly all of our member departments regard crumb rubber modified hot-mix asphalt as having only experimental status in their States, as they seek ways to meet the mandate of Section 1038.

The concerns that most of the nation's public sector highway engineers hold about the use of crumb rubber modified hot-mix asphalt fall into three broad categories: emissions and worker safety; cost effectiveness; and recyclability.

Some State environmental organizations have been running tests, including Florida, New Jersey and Texas. Mr. Welke described a few moments ago what is planned in his and your State, Mr. Chairman. In Florida, a $250,000 worker exposure and asphalt plant emissions study is under way, and the results of that should become available this summer.

The final results of the Texas tests are due also. Pending those results, no Texas plant is permitted right now by their State Air Quality and Control Agency to produce crumb rubber modified hot-mix asphalt.

We are frankly puzzled by the role of the EPA thus far regarding the environmental and worker safety impacts of Section 1038, and why it is falling to State agencies to run tests on the ISTEA mandate. Potentially, there ultimately may indeed be a conflict between what EPA says and what the State agencies say, and the State agencies will prevail, since that is who our people work with and for.

As I describe in my written testimony, we know that the EPA has been made aware of possible environmental concerns regarding crumb rubber modified hot-mix asphalt. The Asphalt Institute provided us with a copy of a letter and report they sent on April 6 to the EPA. We have given you copies of that.

The Asphalt Institute report, at over an inch thick, is truly weighty, and concludes with three recommendations to the EPA aimed at providing answers to important environmental and health issues. Mr. Chairman, the report summarizes why many are hesitant to proceed without answers that can only come from further research.

On cost effectiveness, our January and most recent surveys show ongoing concern about the cost effectiveness of crumb rubber modified hot-mix asphalt. It may be possible to offset some of this cost in specific instances by reducing pavement thickness, which California does on some projects with crumb rubber modified gap-graded asphalt mix, but there are many asphalt mixes.

Whether or not can you reduce thickness on all of them or not to offset cost—and there is increased cost—is an engineering unknown at this point. A few States believe there are cost-effective applications, but most report otherwise at this stage.

Recyclability is a major issue. Recycling of asphalt pavements is now routine and of importance to the States. The potential for recycling crumb rubber modified hot-mix asphalt has not been shown, and some experts question if it can be accomplished.

If recycling is not achievable, then Section 1038 might simply convert what is now a 20-pound scrap tire solid waste problem into a 2,000 pound scrap asphalt pavement solid waste problem.

In my written testimony I have described research efforts by FHWA, AASHTO and the States to address these areas. Thus far, research results have not been adequate to resolve our member department concerns.

Mr. Chairman, the stated purpose of this hearing was to develop an informational record on crumb rubber. We hope that our testimony adds to that.

In closing, I would like to offer two observations. My first observation: Among our AASHTO member departments there are many unanswered questions regarding the use of crumb rubber from scrap tires in hot-mix asphalt. These questions include: Is crumb rubber modified hot-mix asphalt effective?

Will crumb rubber modified hot-mix asphalt produce pavements as least as good as today's conventional HMA pavements?

Is the use of crumb rubber in the quantities specified in Section 1038 compatible with or counterproductive to the results of the SHRP research?

Will routine use of crumb rubber modified hot-mix asphalt increase worker and environmental risks, in turn raising new liability issues for public agencies and private sector contractors and civil engineers?

Can pavement designers sign plans for crumb rubber modified hot-mix asphalt projects as professional engineers, with the assurance of quality expected of them by the public as PEs?

My second observation. Without having the answers to these questions, Section 1038 in effect mandates that our member departments proceed to large-scale utilization of crumb rubber modified hot-mix asphalt, and to continue such use until some day when we might have the answers to these health, environmental, and engineering concerns.

Mr. Chairman, I submit that the proper response to my first observation is, if we are serious about implementing Section 1038, we should first adequately research the questions posed, and then make a final judgment on the crumb rubber HMA mandate.

As to my second observation, I recall the very old cliche about putting the cart in front of the horse. We should put getting satisfactory answers to the questions in front of the mandate to use crumb rubber from all tires, not behind it.

Mr. Chairman, we thank you for this opportunity, and we will be pleased to answer any questions.

[The prepared statement of Frank Francois follows:]

American Association of
State Highway and
Transportation Officials

Wayne Muri, President
Chief Engineer
Missouri Highway
and Transportation
Department

Francis B. Francois
Executive Director

STATEMENT BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION AND RELATED AGENCIES

OF THE

HOUSE COMMITTEE ON APPROPRIATIONS

Relating to

SECTION 1038 OF THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT
(PL 102-240)

By

FRANCIS B. FRANCOIS

Executive Director, American Association of State
Highway and Transportation Officials

May 12, 1993

Founded in 1914, AASHTO represents the departments concerned with transportation and highways in the fifty states, the District of Columbia and Puerto Rico, to foster the development, operation and maintenance of an integrated national transportation system. The active members of AASHTO are the duly constituted heads and other chief directing officials of the member transportation and highway agencies.

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Mr. Chairman, I am Francis B. "Frank" Francois, and I am Executive Director of the American Association of State Highway and Transportation Officials, known as AASHTO.

On behalf of AASHTO, I am pleased to respond to your letter inviting us to appear and provide our views on Section 1038 of the Intermodal Transportation Efficiency Act of 1991, which is commonly identified as the ISTEA. This section mandates the use of crumb rubber modified (CRM) asphalt by the states, with the intent that the crumb rubber come from grinding scrap vehicle tires.

The use of additives in hot mix asphalt is of course not new, and there are perhaps hundreds of such additives. Nor is it new to utilize rubber as an additive, or even ground scrap tire rubber. Two states in particular, Arizona and California, have experimented with putting rubber in hot mix asphalt for many years, with some success. But until the passage of Section 1038, most of our member departments did not utilize scrap tire rubber in asphalt pavements.

The role of the member departments of AASHTO generally is to respond to national transportation policies including this Congressional mandate on CRM asphalt, and undertake their implementation. Following passage of the ISTEA, our member departments proceeded to begin implementation of the Act, including Section 1038. It soon became apparent that Section 1038 notwithstanding, there were several engineering and environmental questions that in the judgement of our member departments should be answered satisfactorily before full-scale implementation of the CRM asphalt mandate is undertaken.

These engineering and environmental questions have caused most states to move cautiously in initiating and expanding the use of CRM asphalt. At the same time, our member departments recognized that a stated key goal of Congress in enacting Section 1038 was to help dispose of the nation's stockpile of scrap tires, to which vehicle users add daily. We recognize that health hazards that can be posed by piles of scrap tires and the need to properly dispose of them, goals which we strongly support. Given the engineering and environmental concerns our member departments have with the CRM asphalt mandate, we accordingly considered other potential ways in which we could contribute to disposing of scrap tires in a safe and hopefully beneficial manner.

In reviewing Section 1038, we found what we believed was an emphasis on finding alternatives to CRM asphalt for disposing of scrap tires in highway projects, which if acted upon might allow our engineers to address the scrap tire problem while also protecting the integrity of our asphalt pavements until such time as the engineering and environmental concerns surrounding CRM asphalt could be answered through research.

AASHTO's Highway Subcommittee on Materials proceeded to develop a resolution on this issue, which resulted in the adoption last October by our AASHTO Board of Directors of AASHTO Policy Resolution PR-15-92, titled "ISTEA Minimum Utilization Requirements for Recycled Rubber - Rule Making Allowance." A copy of PR-15-92 is provided. Included in the "Whereas" portion of PR-15-92 are the following observations:

- ... the Secretary of Transportation and the Administrator of the Environmental Protection Agency are designated to coordinate and conduct a study of asphalt pavements containing asphalt rubber to determine the threat to human health and the environment, the degree of recyclability, and the performance under various climatic conditions,"

- "... additional studies are required under subsection (b) to determine the economic savings, technical performance, threats to human health and the environment, and environmental benefits to using recycled materials in highway devices, and appurtenances and highway projects,"

- "... subsection (c) provides that the Secretary of Transportation should encourage the use of recycled materials determined to be appropriate by the studies of subsection (b)," and

- "... subsection (c) states the minimum utilization for asphalt pavements containing recycled rubber may not be met by any use of techniques found to be unsuitable for use in highway projects."

Our resolution PR-15-92 included two resolves, the first of which requested that the U.S. Department of Transportation, in rule making for Section 1038, allow flexibility in the use of recycled rubber such that the recycled rubber used for all potentially beneficial related applications be included in the minimum utilization requirements of Section (c). The Federal Highway Administration (FHWA) responded to this resolution on behalf of U.S. DOT on November 20, 1992, as follows:

> "The FHWA has not initiated rulemaking of this section. Section 1038 of ISTEA specifically focusses on the use of recycled scrap tire rubber in asphalt pavements. Section 1038(d) has a minimum utilization requirement for asphalt pavement containing recycled rubber beginning in 1994. There is a provision that up to 5 percent of the minimum utilization requirement can be met by asphalt pavements which contain other recycled materials determined to be appropriate by studies under Section 1038(b). However, the legislation does not provide the flexibility to include uses of recycled rubber which are not asphalt pavement related in meeting the minimum utilization requirements. The relief sought by this Resolution would require legislative action." (emphasis added)

The second resolve of PR-15-92 provided that in the event the U.S. DOT cannot comply with AASHTO's request, then AASHTO should seek:

> "...a Congressional revision to Section 1038, subsection (d) of the 1991 Act to allow flexibility in the use of recycled rubber such that the recycled rubber used in all potential transportation related applications be included in the minimum utilization requirements of Section (c)."

We have in fact now made such a request to Congress, in a letter sent on April 14, 1993 to the leadership of both authorizing committees. A copy of that letter is attached.

For the record, I would note that both AASHTO resolution PR-15-92 and our April 14, 1993 letter to the authorizing committees were approved by the required two-thirds vote of our 52 member departments. Thus, the positions stated in these two documents were not lightly taken, but instead represent a broad consensus of opinion among our member departments.

Given the position adopted by the FHWA on behalf of U.S. DOT, our member departments are thus faced with the mandate to proceed with CRM asphalt, even though it has been amply demonstrated that there are a number of other civil engineering highway uses for scrap tires. One documentation of such alternate uses is contained in a report titled "Scrap Tire Utilization Technologies" published recently by the National Asphalt Pavement Association. We understand that copies of this report have been supplied to the Subcommittee.

The NAPA report documents use of scrap tires for energy purposes, civil engineering and CRM modified asphalt. The section on civil engineering uses describes non-pavement uses of scrap tires in Oregon, Vermont, Minnesota and Washington as a lightweight fill, in Vermont as a drainage layer, and in California and North Carolina for slope stability/retaining walls. If the goal of Section 1038 is to dispose of scrap tires, there are clearly several good techniques for doing so other than CRM asphalt.

AASHTO Survey on CRM Asphalt

After the FHWA's November 20 response to AASHTO resolution PR-15-92, and before proceeding with a request to the authorizing committees, we believed it important to determine the actual response of our member departments to the CRM asphalt mandate of Section 1038. Accordingly, in January we undertook a survey of all of our member departments, which resulted in a report to our Standing Committee on Highways dated April 1, 1993, copies of which are being filed with the Subcommittee.

This April 1 AASHTO survey report found that CRM usage and planned usage is growing rapidly as states try to meet the requirements of Section 1038. We found that in response to the mandate, states plan to use nearly four times the amount of CRM hot mix asphalt (CRM HMA) pavement as they did last year. The survey also found that currently high costs are associated with using CRM HMA, commonly two times or more the cost of conventional HMA.

It is understood that the cost data provided by our member departments must be used with caution, and that costs depend upon several factors including the experience of the state and the contractors with CRM HMA and the process actually used. With respect to the process, it is clear from our survey that use of a process under a currently in force patent costs more than the use of a non-patented process, when royalties must be paid. Hopefully, costs would come down over time as patent monopolies expire and are replaced by competition, and states and contractors gain more knowledge. But it is clear that CRM HMA pavements are more costly.

In an effort to provide a perspective on the increased costs of CRM HMA pavements, our April 1 report provides an estimate of the fiscal impact of Section 1038 in 1997 if it is fully implemented. Our estimate is based upon the following assumptions:

- States would be placing approximately the same tonnage of HMA pavements under Federal aid programs in 1997 as they did in 1992.

  Under this assumption, in 1997 some 40 million tons of CRM HMA would be placed, with an average of 1 percent or 20 pounds of CRM per ton of CRM HMA.

- Use of patented processes would drop from about 70 percent today, to 60 percent in 1997. We believe this is a reasonable assumption, given that some states are experimenting with non-patented processes, and some current patents are scheduled to expire by 1997.

- Except for a possible decrease in patent royalties, costs in 1997 would remain at the levels documented in our survey.

  As stated earlier, today's costs must be used with caution since competition and other factors might lower costs by 1997. On the other hand costs might remain at current levels or even climb, if studies show that the use of CRM HMA creates new environmental risks, for example.

Given these parameters, and a zero percent discount rate, we calculate that $0.9 billion would be required annually to cover the additional costs of CRM HMA over HMA. Assuming a 4.0 percent discount rate, we calculate the added cost at $1.0 billion. Coming at a time when full funding of the ISTEA appears in doubt and states are under increased revenue pressures, any added costs for CRM HMA is of real concern.

Moving beyond costs, our April 1, 1993 report includes a number of other findings:

- At least five, and possibly several more, of our member departments are planning to seek a three year waiver from U.S. DOT of Section 1038 in their state based upon one of the three grounds included in the Section. Of those states responding, some 15 said they were still accumulating data, before making a waiver decision.

- At least five member departments are seeking or considering waivers based upon an insufficient quantity of scrap tires in their states.

- Some 17 states reported they have been in contact with state environmental, health, and/or labor agencies with regards to emissions and worker exposure testing associated with CRM HMA. Three states reported they have performed studies, and some 13 indicated they will be undertaking studies.

There are a few states, Arizona and California in particular, that report some success in utilizing crumb rubber from scrap rubber tires in hot mix asphalt. Both of these states have been using it for years in some applications, with satisfactory results. Florida is now experimenting with the use of crumb rubber in processes that are outside the CRM patents, and which show promise. These few states aside, CRM HMA is not in routine use now. Nearly all of our member departments regard CRM HMA as being in the experimental status in their states, as they seek ways to meet the mandate of Section 1038.

Survey Update

The detailed responses from our member departments included in our April 1 report provide considerable information about the concerns most of the nation's public sector highway engineers hold about the use of CRM HMA. These concerns fall into three broad categories:

- Emissions and worker safety
- Cost effectiveness
- Recyclability

In preparation for this testimony, over the past several days the AASHTO staff has talked with a number of our member departments, and reviewed correspondence and reports from them, to update and supplement our April 1, 1993 report with concentration on the three listed concerns. The following is a sampling of our observations resulting from this update effort.

Emissions and Worker Safety

NEW JERSEY

There have been no worker exposure tests performed in New Jersey on CRM HMA. They have conducted one non-instrumented test (opacity and odors) and two instrumented tests at asphalt plant stacks. The non-instrumented test found no significant difference in stack emissions between the standard mix and the asphalt rubber mix containing 0.6% rubber.

One of the instrumented tests was performed at a batch plant with a CRM open graded friction course containing 0.9% crumb rubber. The stack emissions in this test were within permissible levels, but there was no comparative stack emissions test on the standard mix performed. Therefore it is not known from this test if there are differences. The other instrumented test was performed on a rubber-RAP mix containing 3% crumb rubber and a standard RAP mix at a counter flow drum plant, which is believed to be the cleanest of many plant types. Tests for hydrocarbons, carbon monoxide, and particulates were performed. They found minimal differences in levels of hydrocarbons and particulate, and significant differences in the level of CO (carbon monoxide). Carbon monoxide levels were found to just exceed the permissible levels in one test. New Jersey did not test for VOC's or aromatics.

NORTH CAROLINA

North Carolina, in a letter to EPA Administrator Carol Browner, noted that CRM HMA requires hotter mix temperatures than standard HMA, and that "Observations of asphalt rubber production and application operations at these elevated temperatures often exhibit an increase in visual emissions or increased opacity."

TEXAS

Texas has constructed 7 CRM HMA pavements to date, and in cooperation with the Texas Air Control Board has conducted two stack emissions tests. These tests were performed because the Texas Air Control Board would not issue permits to asphalt plants until it is proven that emissions were within acceptable limits. The results of the tests at one site reportedly were unstable and therefore not useable. The results at the other site indicate that the CRM HMA at 325 degrees F had significantly lower particulate matter (76% - 81% less) and benzene (33% less) than HMA at 325 degrees F, but had substantially higher visible emissions (37% higher), volatile organic compounds (244% higher), and styrene (1667% higher).

It should be noted that normal operating temperatures for CRM HMA are the same as tested, but that normal operating temperatures for HMA are 25 degrees lower or 300 degrees F. Comparisons of emissions were also performed between CRM HMA at 300 degrees F and HMA at 325 degrees F. Although neither one of these products were tested at their normal temperature, these tests do provide some evidence as to what might happen as temperatures increase as is normal for CRM HMA products.

These Texas results probably will be considered inconclusive. Still outstanding are the results expected from a toxicology report, which should contain estimates on exposure to pollutants by adjacent property owners. The requirement in Texas is that emission levels on adjacent properties cannot exceed 1% of the permissible 8 hour worker exposure level, to protect those with respiratory diseases, the elderly and children.

It is believed that when the final results are available, asphalt plants will be permitted to produce CRM HMA in Texas on a limited basis with emissions tests run. However, currently no Texas plant is permitted to produce CRM HMA.

FLORIDA

Florida is currently performing a $250,000 worker exposure and asphalt plant emissions study. The results should become available this summer. It is expected that the results may show higher levels of pollutants for CRM HMA than for conventional HMA, but that such will probably not exceed acceptable limits.

Caution needs to be exercised in interpreting these test results, which

I would note are being run by state agencies, not the U.S. Environmental Protection Agency. We frankly are puzzled by the role of EPA thus far regarding the environmental and worker safety impacts of Section 1038, and why it is falling to state agencies to run tests on the ISTEA CRM HMA mandate.

In any case, we do know that the EPA has been made aware of possible environmental concerns regarding CRM HMA. This week, The Asphalt Institute provided us with a copy of a report on this subject, which includes a letter dated April 6, 1993 addressed to Dr. Terry Harvey, Director of EPA'a Environmental Criteria and Assessment Office.

The following are some quotes from the Institute's April 6 letter:

> "... asphalt-rubber blends, as well as the fumes, mists, vapors, particulates and other emissions that are created when such materials are heated for application or recycled, are extraordinarily complex chemical mixtures. As we understand it, EPA believes - and AI strongly agrees - that the only way to develop a scientifically sound assessment of the health and environmental risks that may be posed is through direct studies of such mixtures. To be sure, risk assessments based on the components of complex mixtures are sometimes appropriate as a "second-best" approach....Unfortunately, although existing data from the industry research program and other sources might support such an assessment for conventional asphalt fumes, the requisite compositional, emissions and exposure information is not presently available for rubberized asphalt."
>
> "Nevertheless, there is a wealth of available data on the chemical composition of tire rubber. There is also, in the words of Section 1038, "reliable evidence" that many of the ingredients of tire rubber are hazardous to human health or the environment, presenting well-documents risks of cancer, lead poisoning, chronic respiratory disease, allergic sensitization, dermatitis, and other serious health effects. As discussed below, the compounds of greatest concern, due to their high concentrations in tire rubber, the severity of the health hazards they pose, and the potential for human exposure, include aromatic and other oils containing significant levels of carcinogenic polynuclear aromatic hydrocarbons ("PAHs"), carbon black, nitrosoamines, and heavy metals such as cadmium and lead. What is not currently known, however, is whether these and other toxic constituents of rubber are likely to be present in the fumes, particulates, mists, vapors, leachate, and other environmental releases from rubber-modified asphalt at levels sufficient to pose a significant risk. Nor is it known whether these materials will pose a greater or lesser risk as part of a complex mixture than they do as individual agents."

The 15 page letter concludes with three recommendations, which can be summarized as follows:

> "First, for the reasons described above, the DOT/EPA report under Section 1038(b)(5) should evaluate, not the existence of an actual risk or actual hazard, but rather the threats - the potential hazards - of

introducing waste tire rubber into asphalt."

"Second, EPA's section of the report should specifically identify the gaps in the available data and recommend to Congress that funds be appropriated promptly for the needed research."

"Third, EPA should continue to collect relevant data even after work on the report is completed."

Mr. Chairman, we have acquired copies of this Asphalt Institute report for the Subcommittee, and such are being provided with this testimony. We do not know EPA's response to this report, or what its plans are to determine that CRM HMA does not pose unacceptable environmental and health risks over conventional HMA. But the report summarized better than we can why our member departments are concerned about these risks, and why many are hesitant to proceed without answers that can only come from further research.

Cost Effectiveness

The AASHTO survey shows that the average cost per ton for CRM HMA is 50% to 100% higher, depending upon whether a patented or non-patented process is used, than conventional HMA. It may be possible to offset some of this cost in specific instances by reducing pavement thickness, which California does on some projects with CRM gap-graded asphalt mix. There are also some applications, such as chip seals, where the addition of crumb rubber might provide an advantage. However, some states are moving away from chip seals because of the potential tort liability resulting when chips become free and damage vehicles. A few states believe there are cost effective applications for CRM HMA, but most report otherwise.

ALASKA

Alaska constructed several PLUSRIDE CRM HMA pavements prior to 1988, when they report they were stopped by the FHWA due to the inability to get competitive bids. They used CRM for special applications, when insulated pavements and improvements in stopping distances on icy pavements were required. They have not used any CRM HMA pavements since, but plan to begin experimenting with them again. Although Alaska reports improvements in stopping distances for CRM HMA pavements, New York and Montana report no such differences.

ARIZONA

Arizona, a state with substantial CRM experience, reports that it does not permit thickness reduction so as not to reduce the structural capacity of the pavement. They advise us that they believe the use of CRM HMA reduces maintenance cost, but that it does not extend the life of the pavement. Arizona considers itself a routine user of CRM open graded friction course riding surfaces.

CALIFORNIA

California is the only state we are aware of that now allows the reduction of pavement thickness for specific applications of CRM asphalt. California has also found that the addition of crumb rubber permits laying a thicker chip seal layer, which can be an engineering advantage. However, Montana and other states have had poor experiences with such CRM chip seal unravelling. The state considers itself a routine user of CRM gap-graded asphalt rubber mix.

CONNECTICUT

Connecticut placed 50 CRM HMA test sections in the 1970's and found no performance benefit over conventional HMA. They reported in our survey that they pay $40 per ton for conventional HMA and $75 per ton for open specification CRM HMA.

FLORIDA

Florida, which has constructed at least seven CRM HMA projects, advises that it does not permit reduction of their typical 5/8" to 1" thick surface course. Florida has four to five years experience with CRM HMA projects. They hope that their CRM HMA surface courses will last about two years longer than their conventional surface course, which lasts from five to eight years, but it is still too early to determine what the life of these pavements will be.

KANSAS

While Kansas has done several CRM experimental projects, it does not consider itself to be a routine user of CRM HMA pavements.

MONTANA

Montana has constructed two CRM HMA projects. The first was a PLUSRIDE surface course section placed about eight years ago, which is performing well. The second was a chip seal project build in 1991, which failed. The state has one project planned for this year, and reports it has found no improvements in skid resistance or ease of snow and ice removal.

NEW YORK

New York has constructed two rubber-modified asphalt concrete overlays, and in December, 1992 produced a report providing a three year evaluation of the results. The report finds that after three years, "conventional and rubber mixes tested are performing comparably with respect to rut resistance and cracking." Also, "Mixes with 1-percent rubber have shown little or no raveling distress; however, those with higher rubber mix percentages have shown unacceptable amounts of raveling." The report finds that "Conventional and rubber mixes both exhibit acceptable surface friction," and that "rubber mixes demonstrated no ice-shedding abilities." Copies of the report are being provided to the Subcommittee.

NORTH CAROLINA

North Carolina reported to us that the state has only placed two CRM HMA projects, both using the dry process, and both of which have failed. They have seven other projects under contract, and regard themselves as being very much in the experimental state. They expressed a concern that CRM HMA pavements will not pass upcoming SHRP standards.

TEXAS

Texas has constructed seven CRM HMA projects over three years, of which four show signs of early distress and have required corrective action including complete removal. Of the three projects that are performing satisfactorily, one was placed three years ago, another two years ago and the last one was placed last year. It is too early to draw any conclusions about the expected life of these three pavements.

There have been a number of claims of engineering superiority for CRM HMA pavements. Thus far, the experimental use of CRM HMA by the states have not generally shown such superior results. Indeed, a number of states report engineering difficulties, and poorer results with CRM HMA than with conventional HMA.

We believe it is evident that CRM HMA is still in the experimental stage, and that we still have much to learn about it from an engineering viewpoint. Again, further research is needed.

Recyclability

NEW JERSEY

New Jersey is the only state we found in our update effort that reported having recycled a CRM HMA pavement. The recycled pavement was placed less than a year ago and is performing satisfactorily.

The issue of recyclability is a major one for our member departments, since recycling of asphalt pavements is now routine and of importance to the states. The fact is that the potential for recycling CRM HMA has not been demonstrated, and some experts question if it can be accomplished. If recycling is not achievable, then as one state noted Section 1038 might convert what is now a 20 pound scrap tire solid waste problem into a 2,000 pound scrap asphalt pavement solid waste problem.

CRM Asphalt Research

FHWA

Mr. Chairman, as the Subcommittee is aware, the ISTEA mandates the Federal Highway Administration to do certain research in connection with Section 1038. The first research product is to be a report to Congress due by June 18, 1993, which as we understand it will be based on a survey of currently available information and data. We of course have not seen a copy of the report, but feel that since it of necessity must be based on available research it will not dispose of many of the issues that have been raised.

We understand that to fill in the expected gaps of this first report and to provide new information, the FHWA is working with our member departments to establish a pooled fund study focused on determining the long term performance of CRM asphalt pavements. As of a few weeks ago, we are advised that some 32 states have agreed to participate in this study, which is expected to cost over $1 million. That so many states are participating, Mr. Chairman, again demonstrates the concerns held by our highway engineers about the CRM mandate.

To supplement this pooled fund effort, we understand that the FHWA will conduct a related study looking at the laboratory aspects of CRM, including mix design and materials analysis. It is estimated that this study might cost $1.5 million. To our understanding, neither of these FHWA research projects is in a go status as of this time.

AASHTO

SHRP

AASHTO developed the work program for the Strategic Highway Research Program (SHRP), and worked to bring SHRP into being. The actual birth of SHRP came when Congress approved the program in the 1987 Act, and earmarked funding that would have otherwise flowed to the states for the research. The five-year highly targeted SHRP effort is now nearly at an end. The FHWA has accepted the Long Term Pavement Performance portion of the SHRP research, and has also moved aggressively to help the states and the highway community in general implement the SHRP research products.

In developing the SHRP work program, AASHTO supported a major focus on asphalt research. We did this because we believe we need better asphalt pavements. Included in that asphalt research was an examination of the chemical characteristics of the some 100 different asphalts used in the United States, and a host of asphalt additives, including rubber. We did not, however, undertake extensive research on CRM HMA in the SHRP program.

The goal of the SHRP asphalt research was to build better, longer lasting asphalt pavements, a goal which we believe we have achieved. We are now concerned that the Congressional mandate to dump CRM into our new SHRP asphalts to produce linear landfills for scrap tires is counterproductive at best, and at worst that demands on the states to fully implement Section 1038 could slow or even defeat introduction and adoption of the SHRP research results.

NCHRP

Mr. Chairman, as you also know, AASHTO is responsible for direction of the National Cooperative Highway Research Program (NCHRP). We have initiated two NCHRP projects regarding CRM, the first being NCHRP Project 20-5, Topic 20-02, titled "Uses of Recycled Rubber Tires in Highways." This is a synthesis project, and the principal investigator is Dr. Jon Epps. The second project is NCHRP Project 20-7, Task 58, which is titled "Information and Evaluation of Crumb Rubber Modifier Technology." This project is in the process of becoming operational.

Taken together, these two NCHRP projects will provide our member departments, and the FHWA, with valuable information.

State Research

While there is no available list of research on CRM being conducted by our member departments, we do know that such research is underway in states such as New Jersey, Florida and Texas. Results from these efforts will be broadly available.

Further Research

The question can be asked, is there need for still more research on CRM asphalt? Based on the many unanswered questions facing the full implementation of Section 1038 of the ISTEA, there are many who believe that we are far from answering those questions.

For over 20 years, researchers have explored the use of discarded rubber tires in highway pavements. Some of this research has yielded promising results. But highway engineers and contractors are stating that there are still important, unanswered questions such as:

- the effect of CRM on pavement performance;
- CRM asphalt specifications, and in particular specifications that are compatible with the SHRP research products;
- the long-term cost-effectiveness of CRM asphalt pavements;
- the impact of CRM on the ability to recycle asphalt pavements; and
- the health effects to construction workers exposed to crumb rubber asphalt, and related environmental impacts.

Summary

Mr. Chairman, a stated purpose of this hearing was "to develop an informational record on "crumb" rubber." We hope that our testimony contributes toward this purpose.

In closing, I would like to offer two observations on behalf of AASHTO:

1. Among our AASHTO member departments there are many unanswered questions regarding the use of crumb rubber from scrap tires in hot mix asphalt, including:

- is CRM HMA cost effective?
- will CRM HMA produce pavements at least as good as today's conventional HMA pavements?
- is the use of crumb rubber in the quantities specified in Section 1038 compatible with, or counterproductive to, the results of the SHRP research?
- will routine use of CRM HMA increase worker and environmental risks, in turn raising new liability issues for public agencies and private sector contractors and engineers?
- can pavement designers sign plans for CRM HMA projects as Professional Engineers, with the assurance of quality expected of them by the public as PEs?

2. Without having the answers to these questions, Section 1038 in effect mandates that our member departments proceed to large scaled utilization of CRM HMA, and to continue such use until someday when we might have the answers to these health, environmental and engineering concerns.

A proper response to the first observation is, if we are serious about implementing Section 1038, we should first adequately research the questions posed, and then make a final judgement on the CRM HMA mandate.

As to the second observation, I recall the very old cliche about putting the cart in front of the horse - we should put getting satisfactory answers to the questions in front of the mandate to use crumb rubber from old tires, not behind it.

Because of AASHTO's concerns, we wrote to the authorizing committees, requesting that we be authorized to use other methods than CRM HMA to dispose of scrap tires in the highway environment. This would help us meet the goal of getting rid of the health and environmental hazards that piles of old tires represent, without creating any new problems that might result from the CRM HMA mandate.

Mr. Chairman, we again thank the Subcommittee for this opportunity to express our concerns, and will welcome any help you can provide toward a solution. I will be pleased to respond to questions, now or in writing later.

# # # #

STATEMENT OF DAMIAN KULASH

Mr. CARR. Our next witness is Damian Kulash, Executive Director of the Strategic Highway Research Program.

Mr. KULASH. In the interests of time, I will give you a quick summary.

The Strategic Highway Research Program, or SHRP as we call it for short, was created beginning in the early 1980s when there was a lot of media attention and political concern about the condition of the nation's highways and bridges and other public works infrastructure. At that point we realized part of the reason we were having these problems was we had neglected the improvement of the technology that goes into building these facilities.

A number of industry leaders from the States, from the Federal Highway Administration, from the contracting sector, got together and looked at a number of big money targets, areas where the whole sweep of the highway program, we were spending most of our money, where we could make a significant financial difference in terms of how effectively we were doing the job.

That led to the scope of the Strategic Highway Research Program. Congress agreed with that set of priorities, and back in the 1986 highway bill, funded the program to the tune of $150 million in the 1987 Highway Act. We are now in the process of finishing up this activity.

I believe we have distributed to each of the Members a copy of the catalogue of things that have come out of this program. Within the next six months, the staff and the whole activity book will be completely almost phased out entirely. So we are finished with the research phase of this, and the most recent highway bill, the Congress authorized to the Federal Highway Administration funds to follow through and make sure some of the improvements that were developed in this program were put into practice. Over the next five or six years, FHWA will be developing a program in that area.

About a third of our program dealt with asphalt, Mr. Chairman. Perhaps the most visible problems we were having back in the early 1980s related to widespread asphalt problems: running of pavements, cracking and a number of other things. And we realized the specifications we are using to purchase this material were based primarily on its consistency, how easy it was to place it and compact it in the field, and our specifications had very little to do with how well it performed in different climates, under different traffic conditions and so forth.

A major part of our effort in the last five years has been to develop a new set of performance-based specifications and tests for asphalt mixtures. We call this system Superpave.

Through all this we have learned a lot about asphalt performance and we have done a little bit of work with crumb rubber as well. Mention has been made here of crumb rubber being used as a modifier to improve its properties. We included some crumb rubber and some other modifiers as well as about 30 referenced asphalt binders so that we could do all of our research consistently over the wide range of materials used in the U.S.

Part of the problem we face is there is an immense variability in all the materials we use in paving construction. You look at a piece of pavement, it all looks alike, but in fact there is a nearly infinite number of combinations of different things out there. Even the asphalt binder we use in paving, asphalt construction in the U.S., comes from about 120 sources of crude oil around the world. Each one of those is different in terms of what kinds of chemicals are in it, how it performs when it is mixed in with different kinds of aggregate, and how it performs when mixed inside with rubber.

So for these reasons we selected about 30 we thought spanned the range of good performers and bad performers with respect tendency to crack, to form ruts, to age prematurely and so forth. And we tested a few of these in conjunction with crumb rubber.

I call your attention here to a figure 1 that is attached to my testimony, which gives you one illustrative result here that shows with respect to one performance feature, the ability to crack at low temperatures, crumb rubber is successful in reducing the stiffness of the asphalt mix with the two different asphalts shown here. But it has very different effects than the two different asphalts.

In one case, the unmodified material that is shown here with asphalt two, before you add crumb rubber, asphalt two is better than asphalt one, for example, after crumb rubber has been added. So it would simply not be cost effective in this sort of application to modify asphalt number one in the hopes of reaching a certain specified level of performance. And we believe that it can be used successfully, like a great many different applications.

The tests we have developed in the Superpave system can help us isolate some of those good applications from the bad ones. We have not done that work. We have simply included crumb rubber to the point that we are fairly certain that our tests do in fact address its mechanical performance properties so States can submit this material or others as they do tests on the very broad array of combinations that are proposed to them.

I believe that Section 1038 and its requirement to use stipulated percentages of crumb rubber would be counterproductive in many respects when viewed alongside the campaign we have all been on over the last 10 years to try to introduce more performance-based specifications into asphalt paving practice.

The key thing I would point out is that this is a huge management chore. Mr. Thompson mentioned earlier this 300,000 people working actually in paving contractors, building these roads. There are about 40,000 engineers at different levels of State highway agencies involved in design and materials tests and other things. And phasing in any new process is a big job.

With respect to our own specifications, again I would ask you to flip to figure 2. This is a case where I think there is relatively little controversy about getting these new performance-based specifications into place. But even there, with very active interest and support from State agencies, from the Federal Highway Administration, with money from Congress to help implement all these things, even in this case, we are talking about an almost five to 10-year period to phase these new performance-based specifications into practice.

So I think you face the very massive introduction of crumb rubber that is called for in Section 1038 would pose, I believe, some similar management and phase-in problems if we are going to do it effectively.

Certainly doing this in conjunction with the introduction of performance-based specifications and without all the homework that is necessary in terms of knowing the performance of this new material, there is going to be a number of failures and costs associated with that process.

This is not a costless provision. Right now we are paying 5 cents a pound for asphalt binder. That is the most expensive part of the risk. Even increased to 6 cents a pound would cost us as a nation $500 million a year. That is, a big change in any increase, even in the area of pennies per pound for binder, have immense consequences when you look at them across the nation's entire system.

I concur with many of the previous witnesses who suggested that we ought to do more homework on this and study the problem before we go further. I think that the new performance-based specifications that have been developed through the cooperation of State, Federal agencies and industry over the last five or six years gives us an excellent basis for doing some of the additional work, figuring out where we can most effectively use crumb rubber and other waste materials to improve the performance of pavements.

I think there is a lot that can be done using this test. Some of the rubber particles, when mixed with certain asphalt binders, seem to expand and absorb some of the asphalt that is in the mix.

In the long term, this sort of reaction could pull out the light end of the asphalt in the paving material and lead to long-term degradation problems that cannot be picked up by any of our current tests.

Well, in brief, Mr. Chairman, I believe that the current bill would impose a number of very severe costs on the system in four different ways.

Number one, we have a number of premature failures that would come about because we haven't done the homework we need to do in terms of figuring out which pavement courses and which climates this material performs best in.

Secondly, I think we would go at it in many cases inefficiently. I think some of the States that are doing this now are putting it down to the bottom course simply to be safe, where they think it won't have any detrimental effects, and some of the long-term reactions may not prove them correct in that gamble.

Third, I think it will interfere with the process we have been on over the last decade to move towards more performance-based specifications in this industry that is mostly paid for with public funds. And I think that making the large investment in crumb rubber now would force its use in areas where its cost effectiveness is not so great and pull funds away from either completing other projects or building facilities to the level of durability that we would like.

Thank you, Mr. Chairman. That concludes my remarks.

[The prepared statement and biography of Damian Kulash follows:]

TESTIMONY OF DAMIAN J. KULASH
BEFORE THE HOUSE APPROPRIATIONS SUBCOMMITTEE ON TRANSPORTATION AND RELATED AGENCIES

Wednesday, May 12, 1993, 9:00 a.m.
2358 Rayburn House Office Building
Washington, D.C.

Good morning. My name is Damian Kulash, and I am the Executive Director of the Strategic Highway Research Program (SHRP). SHRP is a unit of the National Research Council, which is the operating arm of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine complex. SHRP was created through the Surface Transportation and Uniform Relocation Assistance Act of 1987, which authorized $150 million over a period of five years to improve the technology of the nation's roads. The need for such a program of research had been pointed out in a 1984 study conducted by the National Research Council's Transportation Research Board.

The 1987 legislation redirected the nation's highway research resources so that more attention would be focused on some of the most expensive and problem-ridden portions of our massive highway system. During the past six years, SHRP has conducted an intensive research program, and many useful products have resulted. One-third of this overall effort, or about $50 million, was devoted to developing improved performance-based specifications for asphalt.

Recycling our waste materials is an important and necessary goal. But I believe that we can most effectively advance that goal by setting aside the requirements to use crumb rubber that were contained in the Intermodal Surface Transportation Efficiency Act of 1991, and instead focusing on how newly developed performance-based tests can help us reach that goal.

This morning, I will comment only on performance-related aspects of asphalt and asphalt-rubber mixtures. SHRP has not dealt with the environmental issues that may be involved in constructing asphalt-rubber pavements, nor have we explored whether such mixtures can be safely recycled. Perhaps others can comment on these important aspects.

In my testimony this morning, I would like to cover five points:

- what SHRP is and why it was created;
- how the nation can improve the performance of asphalt;
- what we have learned about how crumb rubber affects asphalt performance;
- how the statutory requirement to use crumb rubber could damage asphalt performance; and,
- steps that could be taken to improve the environmental and recycling benefits of the asphalt paving industry without sacrificing performance.

Objectives of SHRP's Asphalt Research

In the early 1980s, the United States was startled to discover that much of its highway infrastructure was in poor condition. Tens of billions of dollars had been invested in building the nation's Interstate Highway System and other highways, but many of these roads had fallen into poor condition. Worse yet, some of these problems developed prematurely. Nowhere was this more worrisome than in the case of asphalt pavements. According to the 1984 Transportation Research Board report, America's Highways: Accelerating the Search for Innovation:

> "Asphalt, more than any other single product, sustains the nation's highway plant and facilitates the flow of commerce and personal mobility. Improvements in asphalt have contributed substantially to the productivity of the nation's transportation system, but the continuity of this success requires constant attention to the problems and promise of this vital material. As the nation increasingly focuses on the rehabilitation of roads, the number of dollars spent on asphalt and the importance of this product to the nation's economy and life-styles increase proportionally.
>
> The introduction of larger and heavier trucks together with growing traffic volumes further increase the demands placed on pavements. As more and more is demanded of asphalt, costly and embarrassing failures continue to occur and defy explanation. The changing chemical composition of asphalt, caused in part by disruptions in world oil supplies, may contribute to those problems. The physical tests and specifications used to classify and control asphalt, some dating from more than 70 years ago, do not always control closely the performance of this material. Construction defects, which account for numerous failures, might be less costly if more reliable, durable asphalts were developed and functional specifications were drawn so that products were more forgiving of field errors. In spite of the immense potential for improving asphaltic pavements, relatively little research is being done. Day-to-day problems with asphalt receive close attention and often ingenious solutions are found, but these ad hoc approaches fall far short of what a well conceived, integrated, fundamental research program in asphaltic materials could achieve."

SHRP was created to fill this gap and to provide a sound, broad basis for understanding and controlling the quality of asphalt. Now, after six years of intensive exploration of asphalt, we do have tools that allow highway agencies and their contractors to specify, design, build, and confirm the performance of asphalt pavements. Using these new tools, we can design and build pavements that will not rut, crack, or age prematurely. We call this new set of tools "Superpave." Superpave consists of new accelerated tests of asphalt performance; new performance-based specifications based on the results of the new tests; and a computer-based system that allows engineers to design pavements using the new tests and specifications.

To develop these new tools, SHRP conducted an accelerated program of research using the best pavement and highway materials laboratories in this country, as well as overseas. U.S. state and federal highway agencies participated directly in this research. Private construction contractors and their suppliers also worked closely with the research team. The result is a set of practical, reliable new specifications and tests for designing and building asphalt pavements that will perform well. These specifications and tests allow agencies to design and build asphalt pavements using the materials available in each region and compatible with anticipated traffic wear and climatic stress.

Ways to Improve Asphalt Performance

The specifications and tests that are now routinely applied to design and build asphalt pavements primarily control the consistency of the material. This is important because the consistency of the material--whether it is too stiff or too fluid--has a direct bearing on the ease with which the pavement will be built. For example, a material that is too stiff may require numerous passes with rollers before it compacts properly. This adds unnecessarily to labor costs during construction.

The specifications now in use are, however, poor at controlling performance. As a result, asphalt pavements built using current tests and specifications may develop ruts when subjected to heavy traffic in hot weather; they may crack under traffic in cold weather; they may disintegrate as they age in wet environments; and they may form fatigue cracks as they are subjected to repeated loads.

Superpave's tests allow highway agencies and contractors to test different materials and designs to see if performance problems like these will result. For the first time, highway agencies and contractors can apply special tests to small specimens of pavement in a laboratory and determine whether they will rut, crack, or disintegrate.

These tests are a major improvement in our technological capacity to build pavements that perform well. In spite of the apparent similarity between one asphalt pavement and another, each pavement is a unique product built primarily from local materials and designed to meet local climatic and traffic conditions. The component materials themselves are extremely diverse. For example,

- The petroleum residual used as the binder in an asphalt pavement in the U.S. may come from any of 120 different sources of crude oil from around the world. Each of these binders has different thermal, adhesive, and chemical properties. Each performs differently.
- The stone and sand used in the asphalt pavement mix are of a nearly limitless variety. The angularity, hardness, gradation, chemical properties, and other performance-influencing features of the aggregate vary from one source to another.

The variety of components used to make asphalt pavements makes it difficult to control its quality. If you buy a box of a company's corn flakes anywhere in the country, you probably get a product nearly identical to that sold elsewhere. The quality of a product like this can be maintained by controlling a small number of manufacturing plants. Not so for asphalt pavements. It is prohibitively expensive to haul massive quantities of the bulk materials used in asphalt pavements for long distances. Instead, engineers must exploit indigenous aggregates and available asphalt binders. Over the years, they have done this with remarkable efficiency and skill, although unexpected performance problems have been unacceptably high.

Highway agencies, contractors, and suppliers have recognized this shortcoming. During the past six years they have worked energetically with SHRP to develop new specifications and tests that will permit them to avoid these problems. They are now working aggressively to put this new technology into practice.

Some Effects of Crumb Rubber in Asphalt

Field experience with crumb rubber in asphalt has produced disparate results. Some asphalt pavements built using crumb rubber have performed excellently; others have performed poorly. We do not have enough field experience with this ingredient, nor have we done enough laboratory testing with it, to know how crumb rubber will affect asphalt performance in many cases. Most of our field experience relates to thin asphalt overlays or membranes placed on top of cracked pavements. This top layer is different from the underlying structural layers in its design and stresses. As the use of crumb rubber in these other layers is contemplated, we have little experience to rely upon.

Crumb rubber, like every other ingredient in asphalt, is itself a complex and variable product. Its chemistry depends upon whether it is produced from truck tires or car tires, and from tire sides or tire bottoms. It can be introduced into asphalt using different processes. Its impact on asphalt performance also depends on how much is used, how high it is heated, and many other factors.

The effect of crumb rubber also depends upon the chemistry of the asphalt binder. In SHRP, we selected about 30 different asphalt binders to use as standardized "reference materials" throughout all of our research. These included binders with good performance features, as well as binders with poor performance features. This allowed us to isolate the effect of the binder on asphalt and to compare results consistently across many different laboratories and testing methods. We also included a variety of "reference modifiers" in our experimental plan. One of these was crumb rubber.

We ran our new performance-based tests on a small number of test specimens that included crumb rubber. Our purpose in doing this was not to evaluate crumb rubber, but to ensure that our tests were sufficiently sensitive to register the differences in performance caused by adding polymers, crumb rubber, or other modifiers to the asphalt binder or mix. Nevertheless, our limited laboratory results with this material mirror what field experience has shown, namely that crumb rubber can have different impacts on performance, depending upon what it is combined with.

For example, the stiffness of an asphalt is a key measure of its tendency to crack at low temperatures. Tensile materials, such as rubber-modified asphalt, can help dissipate the strains that develop in pavements at low temperatures and thereby make the pavements more crack resistant. SHRP's tests show that this is indeed the case for the two binders shown in Figure 1. "Asphalt 1" shows greatly improved cracking resistance when modified with rubber. "Asphalt 2" also shows improved cracking resistance when modified with rubber. But even as modified, Asphalt 1 is not as crack-resistant as Asphalt 2. When cracking threatens to be a problem, Asphalt 1 may not be an acceptable solution, even if it is modified with rubber.

Performance Losses and Economic Costs of Statutory Requirements

Section 1038 of the Intermodal Surface Transportation Efficiency Act of 1991 stipulated that:

> "..Beginning on January 1, 1995, and annually thereafter, each State shall certify to the Secretary that such State has satisfied the minimum utilization requirement for asphalt pavement containing recycled rubber established by this section. The minimum utilization requirement for asphalt pavement containing recycled rubber as a percentage of the total tons of asphalt laid in such State and financed in whole or part by any assistance pursuant to Title 23, United States Code, shall be--
>
> (A) 5 percent for the year 1994;
> (B) 10 percent for the year 1995;
> (C) 15 percent for the year 1996; and
> (D) 20 percent for the year 1997 and each year thereafter."

This same section also authorizes the Secretary of Transportation and the Environmental Protection Agency Administrator to set aside this minimum requirement for a three-period if they concur that various environmental, recycling, or performance problems would result.

Given the current state of technology in which the addition of crumb rubber produces divergent results and in which we do not know which result will accrue in any particular application, it is inevitable that some performance problems will result.

The effect of an across-the-board requirement such as this is to force all states to use crumb rubber to the same statutory percentage, even though some states may have combinations of asphalt binder, climates, and traffic loads that are not amenable to asphalt mixes constructed using crumb rubber.

Crumb rubber has been marketed as an asphalt modifier primarily because it makes the pavement more elastic. This can be an important feature in many cases, such as when a new overlay is being added on top of an existing pavement that is badly cracked. In situations like this, a too brittle top layer would quickly form cracks, while a more elastic top layer would not. Increased elasticity can also be an advantage in very cold climates, where the flexing of the pavement under loads can help prevent ice from bonding to the pavement. On the other hand, including crumb rubber in the asphalt mix could affect its high-temperature performance and aging characteristics in unexpected or undesirable ways.

Using any new asphalt technology effectively is a huge management chore. Asphalt pavements are, in effect, manufactured in place, and many people are involved. When new technology is introduced, many agency engineers, field engineers, inspectors, private contractors, and suppliers need to be retrained. New equipment for testing and production needs to be procured for numerous divisional laboratories and asphalt plants.

From our own experience in getting SHRP's tests and specifications used, making a major technological shift in asphalt technology takes time: 5 to 10 years. The ambitious schedule that we are working with highway agencies to meet would phase in new performance-based specifications by 1998 or 1999 (Figure 2). This is about as fast as this could reasonably be done, allowing time for highway agencies and contractors to obtain the equipment and know-how that they need to apply the new technology. State highway agencies are enthusiastic about this new Superpave technology; they were instrumental in getting this research started, and they are keenly aware of its financial importance. Nevertheless, even with this commitment and enthusiasm, acquiring the equipment and know-how will take five to ten years.

Making effective use of crumb rubber on the massive scale called for in Section 1038 would be a similarly time-consuming conversion.

Congress, recognizing the large scale of the implementation chore for SHRP, in Section 6001 of the Intermodal Surface Transportation Efficiency Act of 1991 authorized funds for this purpose for a six-year period. The Federal Highway Administration is currently administering this implementation program and is working constructively with state highway agencies and with asphalt paving contractors to make sure that the necessary technological capability is developed as rapidly as possible at all levels.

No single component material or pavement design will meet all future needs. Future pavements, like those of the past, must exploit available materials to tailor an economical solution that meets local site demands. With the arrival of Superpave technology, engineers can select materials and designs that produce high-performance pavements.

They can also use this new technology to assure good performance while advancing other environmental and recycling goals. Many materials--crumb rubber, trimmings from asphalt shingle plants, trimmings from industrial polymer products, glass, slag, and incinerator products--have been successfully used in pavements. Their suitability and performance depend upon a host of factors. The performance-based capabilities of Superpave will allow engineers to use laboratory testing to determine how effectively different sorts of waste materials can be used, and to design high-performance facilities that use those waste materials.

The nation has now invested more than ten years and tens of millions of dollars to get us to this point, where we have objective tests and specifications that allow us to determine how different asphalt pavements will perform under varied conditions, without the costs of field trials and full-scale failures.

The benefits of this new technology are huge. The United States now spends $10 billion a year for asphalt pavements. Our current specifications are so limited in their control of performance that great improvements could be made. Even a modest saving of only five percent would yield $500 million each year.

The United States risks slowing down or even canceling out the substantial gains that could be made in pavement performance if statutory compositional requirements overtake sound engineering trade-offs in pavement design. That is, preemptive policies such as Section 1038 force the adoption of technologies with higher cost and uncertain performance. They also interrupt the orderly process of technological conversion that the nation embarked on ten years ago.

Economic considerations must be taken into account as the nation charts an effective course in this area. Certainly recycling of waste material is a worthy goal. But, if we approach this in a way that is highly inefficient, we will not succeed in disposing of waste materials, and we may greatly impair the condition of the nation's highways in the process. Asphalt pavements are built from bulk, low-valued commodities: stone, sand, and asphalt binder. The asphalt binder is the most expensive ingredient, with a cost of around 5 cents a pound. (The other ingredients cost about 1 cent a pound.)

Most modifiers are intended to enhance the performance of asphalt binders but also add to their cost. So does crumb rubber. For example, at 20 cents per pound, adding five percent crumb rubber to a mix is roughly the same as increasing the cost of the asphalt binder from 5 cents a pound to 25 cents a pound. Now five cents per pound may sound inexpensive. If you could get better pavement performance or could serve waste-disposal objectives by going to say, six cents a pound, you may think that is a negligible increase. It is not. Increasing the cost of asphalt binder from five to six cents a pound would cost the nation about $500 million dollars a year in increased paving costs.

Clearly, the much greater cost increases associated with the use of crumb rubber could impose enormous additional costs or draw away huge amounts of funds that could have gone to serve other pavement performance or waste-disposal goals.

The cost of Section 1038 will be very large. By greatly increasing the cost of asphalt pavements, it will reduce the amount of paving that can be accomplished. This will result either in fewer projects being built or in construction of thinner, less-durable pavements. Either way, the condition of the nation's highway system will be adversely affected by these added costs.

Steps Toward Improved Performance

Crumb rubber, other waste products, and other asphalt modifiers offer a wide range of opportunities to design and build asphalt pavements that have excellent performance and which also assist in recycling waste. The United States should aggressively pursue both performance and environmental benefits as it constructs asphalt pavements. Our capacity to do this effectively has never been better, thanks to the development of Superpave technology. But we are not technologically prepared to do this now. Our field experience with crumb rubber asphalt mixes is restricted mostly to thin overlays and membranes and has had discrepant and unpredictable results. We could predict and control this material much better by using accelerated laboratory tests that allow us to predict performance. These tests have only recently been developed. They have not yet been widely applied to crumb rubber mixtures.

To pursue the advantages of tire recycling within asphalt pavements, we should use our new capabilities for predicting performance to figure out where crumb rubber and other recycled material can help and where they are wasteful. This would help to channel waste material into its most cost-effective applications. It would not interfere with the states' own efforts to phase in new performance-based asphalt capabilities.

This sort of evaluation could answer many questions that now impede efforts to recycle crumb rubber. For example, it could distinguish:

- the best processes for recycling rubber;
- which asphalt binders can be improved by rubber modification and which cannot;
- which applications (top course, structural layer, base course) can be enhanced by using rubber-modified mixes; and
- how climate and traffic will influence the performance of rubber asphalt mixes.

Using Superpave tests to address these questions would help produce rapid, reliable answers; it would give states and contractors the confidence they need to apply this material effectively; and it would not disrupt the technological conversion already underway.

Accelerated testing cannot answer all of the questions associated with the performance of rubber asphalt mixes. We also need to know:

- how do asphalt-rubber binders age in comparison to unmodified binders?
- do other processes besides oxidation and volatile loss occur in asphalt rubber mixtures, and how does this affect performance?

Work may also be needed to address the field emissions associated with rubber asphalt mixes, as well as the potential problems of recycling these mixes.

It is possible that the most promising applications for asphalt rubber mixes could be concentrated in certain regions or specialized types of pavements. If so, it may be helpful to explore how other incentive systems, rather than flat statutory requirements, might be used so that these benefits can be achieved fairly and effectively.

Highway pavements do consume enormous volumes of material and thus they do offer an important opportunity to assist in the recycling of waste materials. Our ability to exploit this opportunity will be better once Superpave is phased into use, giving highway agencies the ability to evaluate the performance of new mixes without costly, time-consuming field trials. Using these new tools, states will be in a position to make well-founded decisions about when to recycle more old pavements, industrial scraps, and other wastes while still improving pavement performance.

Congress could accelerate this process by setting aside the statutory minimum levels of crumb rubber use that are called for in Section 1038, and instead helping state and federal agencies develop the information that will be needed to design pavements that incorporate wastes effectively. This same information could give Congress the information it needs to develop fair and efficient incentives for encouraging the recycling of scrap materials in pavements.

Conclusion

In short, I believe that our experience with asphalt-rubber mixes shows that they can have important advantages, in some situations. Both field and laboratory data also show that the performance of such mixes varies widely. We simply are not at a point where we can make effective large-scale use of rubber-asphalt mixes without incurring four costs. First, we would experience a number of premature failures, because we have not yet done the work needed to know where these mixtures perform well and where they do not. Second, we would inefficiently apply asphalt-rubber technology because we have not had a chance to develop good data on the costs and benefits of these mixtures in different circumstances. Third, pushing asphalt-rubber technology too hard before we have a sound understanding of it will conflict with conversion toward performance-based design, which the states and the Congress have been working cooperatively on since 1987. Fourth, making a large investment in crumb rubber recycling will drain funds from other projects whose transportation and environmental benefits may be greater.

It is premature to mandate crumb rubber usage in pavements. Instead, we should be learning how to best use it. Several activities could contribute to sound and rapid evaluation and adoption of asphalt-rubber mixes. The performance-based tests developed by SHRP could be applied to determine how and where we can use asphalt rubber mixes to the greatest advantage. Changes in performance due to aging, oxidation, volatile loss, and other processes need to be addressed. The costs and benefits of different uses of asphalt rubber mixes should be assessed so that fair and effective incentives to use this material can be developed.

Mr. Chairman, I appreciate this opportunity to discuss the performance of asphalt-rubber mixes. I will be happy to answer any questions that you or members of the subcommittee may have.

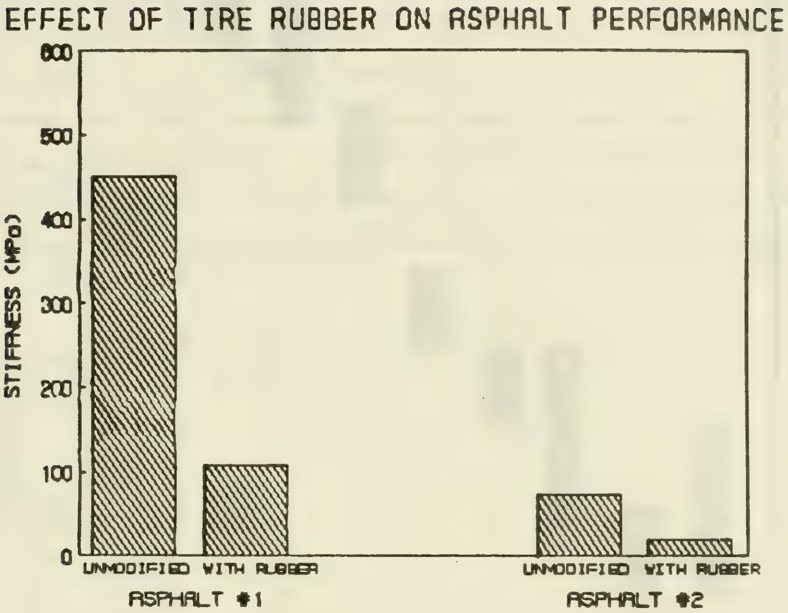


FIGURE 1. Reduced Susceptibility to Low-Temperature Cracking Through Modification of Asphalt Using Crumb Rubber

SUPERPAVE ROLLOUT PLAN

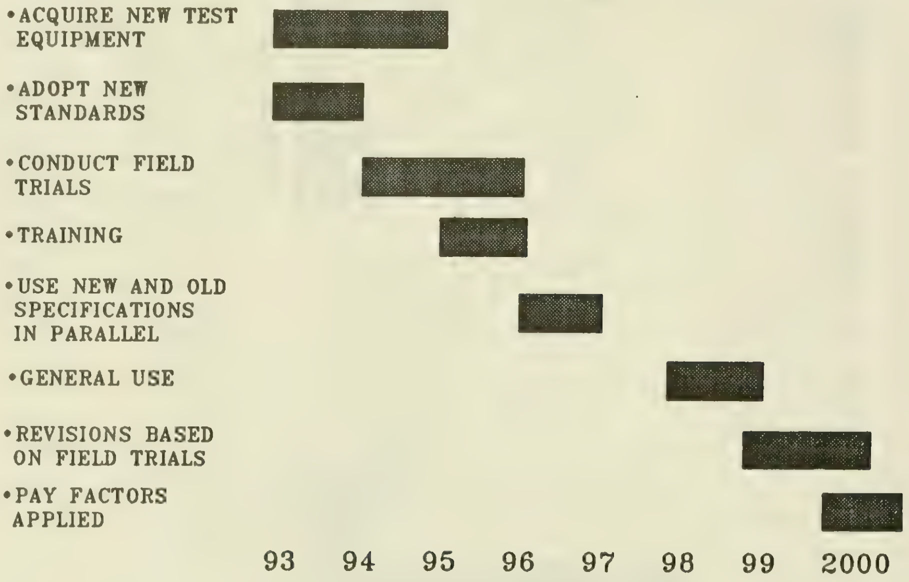


FIGURE 2.

DAMIAN J. KULASH
Biographical Sketch

Damian Kulash is the Executive Director of the Strategic Highway Research Program (SHRP). From 1987 to 1993, SHRP is managing $150 million in product-oriented research to improve pavement performance and to specify materials with improved performance properties. Prior to joining SHRP, Mr. Kulash was in charge of the policy-studies activities of the Transportation Research Board. From 1977 to 1982, Mr. Kulash was deputy assistant director of the Congressional Budget Office, responsible for their transportation and agriculture analyses. Mr. Kulash holds a B.S. in Industrial Management and a Ph.D. in Civil Engineering from the Massachusetts Institute of Technology.

EXPERIENCE WITH CRUMB RUBBER MODIFIED ASPHALT

Mr. CARR. Thank you.

One of the things that we are concerned about on this Committee is doing something that seems good and probably works in year one and year two and year three, but begins not to work so good in year four and maybe slips a little in year five, and by the time you are at year 15, you end up having to reconstruct a highway.

Thompson and I know this, there is a road that runs through one of his facilities, I-94. It wasn't an asphalt job, which he reminds me many times over again, it happened to be a concrete job, but it was a highway expected to last 30 years, and it lasted how long?

Mr. THOMPSON. Seventeen.

Mr. CARR. It had to be completely rebuilt.

Now, this Committee's real concern about cost effectiveness and getting an economic rate of return, when we invest in something we want it to last 30 years. In fact, Dr. Larson, our former FHWA administrator, suggested that in terms of durability, we ought to be expecting a highway to last 40 years and 120,000 pounds. That is relevant to what you said, Dr. Kulash that we ought to be basing some of this on performance, and then decide what we need to meet those performance standards.

So relevant to that, if we are aiming at a 30 to 40-year life before complete reconstruction, what is the oldest rubber asphalt mixture highway segment in America? Do we know that?

Mr. JACOBSON. 1967, Phoenix, Arizona.

Mr. CARR. Would you identify yourself for the record?

Mr. JACOBSON. I am Carl Jacobson of International Surfacing, Inc., of Chandler, Arizona.

Mr. CARR. You are going to be testifying next. Well, give me that again.

Mr. JACOBSON. 1967, the City of Phoenix.

Mr. CARR. 1967 in the City of Phoenix. Well, maybe these are questions for you when you are at the table. Maybe I will postpone some of this.

We are interested in finding out what the history is among the oldest population of crumb rubber modified asphalt.

Mr. WELKE. Mr. Chairman, in Michigan, if I may, the oldest one I am familiar with that I worked on personally was 1978. It is mentioned in my written testimony. We did both processes based on the best technology we were aware of at the time.

I met Mr. Baker then and his father back then when we were setting up the project. We did both the dry and the wet process. The dry process pavement failed in a matter of days. We removed it and replaced it. The wet process lasted us eight years. We overlaid it after eight years. That is the section of road we are going to go up to this summer, take the overlay off, take the rubber asphalt and try to recycle it on a worker fume investigation.

Mr. BAKER. Mr. Chairman, I have Jed Billings from F&F in Arizona that has probably constructed as a contractor, as a member of NAPA, more asphalt rubber work than everyone else combined in this room. And I would like to give him—let him explain a project on I-40 and compare it to conventional asphalt, that it was done and is referred to in a document I submitted to you, written by

Doug Forstie to FHWA requesting the change in experimental classification of asphalt rubber.

And, you know, you can talk about 20-year projects, but sometimes when you are comparing asphalt rubber to conventional asphalt under similar circumstances, also in very difficult climactic conditions you can get some much quicker reads. Maybe he can spend a minute describing that to you. I think that will shed quite a bit of light on the value that asphalt rubber can have.

Mr. CARR. Well, if you can do it in a minute, I would let you. We have a panel that was scheduled at 10:30, and we are already behind. I haven't asked all my questions and Mr. Price hasn't. I don't want to be unfair and cut anybody off, but maybe we can have him join our next panel to give that testimony.

COMPLEXITY OF ASPHALT

Dr. Kulash, you indicate that there is a great deal of complexity to asphalt.

Dr. KULASH. Yes.

Mr. CARR. Would you talk about some of the parameters in that complexity?

Dr. KULASH. There are more different kinds of molecules in asphalt than there are people on this planet. It is a very complex substance.

In trying to set specifications to use it wisely, we don't begin to try to identify the chemistry of each little piece. What we do is hopefully come up with some bands of acceptability related to its suitability and the application we are trying to make of it. Historically that has been mostly workability.

We think it should be more related to its durability in the field, and there are different features of that, that we can test for. The tendency to rut, for example, under heavy traffic in hot weather. The tendency to get too brittle and crack under traffic in cold weather. Aging properties and tendencies to fatigue.

Those sorts of properties can be tested in the laboratory using accelerated tests now, a number of different rheological devices and different laboratory apparatuses, test loadings under different temperatures and so forth can be used to simulate the effect of materials in the pavement and isolate their performance attributes such as cracking and rutting and fatigue resistance.

Mr. CARR. But in terms of the variables in a material sense, how many variables would you say there are in asphalt, just in the material sense, not in the conditions or environmental sense?

Dr. KULASH. In the asphalt mix, some of the things that most affect its performance, the major ingredients, the aggregates and asphalt binder each have key attributes. The aggregates, its gradations have a great effect, the angularity of the material, how fine the material is, those have a lot of effect on performance.

In the case of the binder, I think the key thing is its change in stiffness with temperature. If it changes stiffness a lot as it goes from hot to cold, it will be either prone to rut in hot weather or cracking in cold weather or both.

RECYCLABLE MATERIALS

Mr. CARR. Now, there are, I am told, a lot of materials, and I guess as somebody who has read a lot of laws over the years, this section of ISTEA refers to other materials. I mean, the whole thing is sort of driving rubber, driving rubber, driving rubber.

It does say, "d(2), other materials, any recycled material or materials determined to be appropriate by the studies under subsection (b)," and given the thrust of this whole section, I wonder how much effort the studies will make in terms of other materials. It says that something else may be substituted for recycled rubber under the minimum utilization requirement of paragraph (1), that is, up to 5 percent.

So even if the studies show that there were some other recycled material that would be a better recyclable material in the asphalt, the law itself says you can't use more than 5 percent of it. So that in 1997 you still are forced, regardless of what other materials might be out there and regardless of how much study they might get, you have to have at least 15 percent rubber. That is what the law says.

What other materials are under consideration now? I have heard wood chips, I have heard newspapers, I have heard old Nintendo boxes. I don't know. What other recyclable materials are there out there that are under consideration?

Dr. KULASH. Certainly the largest one is the pavement itself. Recycling of previous pavements in terms of tonnage is by far the largest single material. Industrial scraps that are fairly uniform in composition, trimmings from asphalt shingles, for example, trimmings from certain kinds of plastics can be used successfully. It is a stable, predictable supply of the same material, which makes it easier to work from than other forms of waste, such as consumer waste, which is highly variable.

Mr. CARR. You mean like plastic milk bottles?

Dr. KULASH. That would be highly variable, because different manufacturers' products are probably different.

Mr. CARR. Plastic automobile bumpers?

Dr. KULASH. I am not aware those have been used in recycling.

Mr. CARR. What else?

Dr. KULASH. Fly ash from incinerators has been used, mostly in concrete pavements. Some glass has been used in recycling of asphalt pavements. I am sure folks in the industry know of other materials.

Mr. CARR. I was told by one of your people, Bob Thompson, that newspaper had cellulose fiber——

Mr. WELKE. We call it an extender instead of a modifier. A modifier tends to change the physical characteristics of the asphalt, the glue, the stickum. And that is what you want to do.

Everything is a tradeoff in an asphalt mixture. You want it flexible in cold weather. You want it stiff so it doesn't rut in hot weather. You work between those parameters. If you try to improve one end of the spectrum, you might lose the other end.

The extender, you may be able to put in more asphalt, more stickum, you may get more tensile strength.

Mr. **Baker**. The use of rubber allows for higher binder contents, extends the low temperature property and the high temperature property characteristics of asphalt. That is exactly what it does; imparts the characteristics of the rubber into the asphalt, expanding the temperature range within which it performs, and thickens the asphalt, increasing the viscosity and allows for thicker films and higher binder contents. That is exactly why it works.

Mr. **Welke**. We have been working in that direction with rubber for 20 years and we find a lot of tradeoffs in that particular statement. In particular, we tend in the highway engineering profession to be quite conservative.

We have had people come along and sell us things, and in Michigan we are paying tens of millions of dollars each year to correct wrong decisions made 20 years ago, right now. I can get into a great deal on that.

In particular, our goal is obviously to improve the binder. One thing we need to do—two things we need to do. You do the physical testing to see the research, to find out, and then you do the long-term performance evaluation.

Mr. **Carr**. An extender—we got sort of sidetracked there. A modifier improves the stickum, I think was the——

Mr. **Welke**. An extender allows you to put more stickum in, more glue.

Mr. **Carr**. More glue in. All right. But it is a recyclable material. Is that something that is used in States like Michigan? Do you put extenders in?

Mr. **Welke**. Yes, we use both modifiers and extenders. We have our standard specification required on heavy commercial traffic, the top course of asphalt pavements would have like a latex rubber as a modifier put in it to help the parameters at the low temperature and the high temperature, to help control rutting.

Mr. **Carr**. You are jumping ahead of me a little here, but the statute here does not mention the word modifier or the word extender.

What concerns me is that they want things recycled, so, basically, the people who wrote this don't really care. They just want stuff put into it, so presumably you are meeting your goal whether you meet it with an extender or a modifier.

Mr. **Baker**. Chairman Carr, I believe if you go back to the authors of the legislation, the intent of the legislation was to build better roads. The side benefit was recycling. And it was basically done around the use of crumb rubber as a modifier, which has 20 years of experience. Because of political pressures coming from other products, there was some of this included in in the legislation.

But it essentially was by the authors, the intention was to build better roads, and it was their understanding that ground rubber incorporated in asphalts will build better roads.

In the States of Arizona and California this year they will use more than a million tons of asphalt rubber hot mix. And that is a direct result——

RECYCLABILITY OF CRUMB RUBBER ASPHALT

Mr. CARR. The authorizers intend a lot of good things, and they do, I am making a very serious statement there, they look forward six years in intending a lot of these good things. This Committee has to figure what happens next year and the following year in terms of money. Sometimes we find that notwithstanding their best intention, it doesn't work out that way. That is what we are trying to do here today, is find out exactly what they intend.

Now, I have a lot of questions, and some of these I'll ask for the record, in the interest of time. My good friend from North Carolina has a number of questions. So we want to step right along.

It seems that one of the key issues here is the recyclability of crumb rubber asphalt. There is very little information on this point. However, New Jersey apparently has done one successful recycling of this.

What I have learned so far, that in spite of recycling, which is now going on all over the country of existing asphalt highways, that there are limitations. I was reading material before this hearing yesterday, and apparently you have to add lots of new aggregate to the recycled asphalt pavement to make the new pavement.

In other words, I think you can only, in a conventional process, add 15 percent to 50 percent of old recycled asphalt pavement to get the new product. This new process of microwaving asphalt that is now being investigated and used aggressively, apparently in Los Angeles, indicates that you may not have to put any new aggregate in, but even if you do, it is only a small amount.

It has some other problems, which I identified in terms of metal. Apparently the biggest problem being that the milling machine teeth sometimes get thrown into the mix and they have to have a way to get that stuff out of there because it will cause a hot spark going through and the microwave doesn't microwave the asphalt, it microwaves the aggregate, which heats the aggregate, which in turn them slowly heats—am I on track so far?

Mr. WELKE. Yes.

Mr. CARR. Now, relative to Mr. Baker's interest here, wouldn't we want to know that rubber, crumb rubber asphalt would perform well in that microwave environment? I mean, maybe you know that already.

Mr. BAKER. Mr. Chairman, actually the company that you mentioned, Cyclene, that is developing this process, is a member of the Rubber Pavements Association, and they did a small test section in Texas last year, and they are expressing a strong interest in developing this process using rubber in this technology. So they obviously believe strongly that this has some strong potential.

The whole microwaving process is relatively new. It is still in the developmental stages. But because of section 1038, things like Cyclene, in trying to incorporate rubber and asphalt, it is being driven by section 1038.

New innovations-there are several companies involved in combinations of polymers and rubber and more user-friendly uses of rubber in asphalts, and Cyclene, the microwave process is a perfect example of where that might have some long-term extended benefits.

Mr. Carr. But it would seem to me that would be an important thing to know, because if it was not able to be used in a Cyclene microwave-type technology, the tradeoff then would appear to be that 100 percent recyclable normal asphalt or nonrubber asphalt versus the rubberized asphalt. There would appear to be a recycling tradeoff because otherwise you would be back down into the 10 to 15 percent recyclability with most of the rubber—most of the tires making a detour, rather than going directly to the landfill. They would be detouring through the pavement of some city for a few years, and then go to the landfill. But that would be an important thing to know, wouldn't it?

Mr. Baker. The microwave process is actually used in the rubber industry pretty extensively. I mean, it is used to preheat the treads sometimes on tires, preheat rubber prior to being—going into a molding process.

So the whole concept of microwaving is maybe new to recycling in the paving industry, but it is something that has been developed over the past five to 10 years in the rubber industry.

Mr. Carr. But I am told in the Cyclene process, the important fact here is that you don't microwave the binder or the modifier or the extender. You are heating the aggregate. And then the aggregate in turn heats the other. And it has to do with rate of temperature transfer, and I don't want to get too technical here because I will get quickly over my head, and I am probably there already.

But I guess, Mr. Baker, what this gets to is that this area is maybe fixed in your mind, and you are obviously an excellent spokesperson for your position, but it is not fixed, and there are apparently some uncertainties in the minds of others, and yet this statute just sort of drives a hard result.

And I don't think Mr. Thompson, in all the conversations I have had with Mr. Thompson that are all off the record, he has never told me that he is opposed to using rubber. But he has been very consistent with his public statement today, that there is a learning curve, a confidence curve, that people like Mr. Thompson and people like Mr. Welke and others represented by Mr. Francois, and apparently given performance factors that Dr. Kulash has outlined—performance factors, incidentally that this Member of Congress is very friendly toward—I think that is one of the ways we ought to go, that this 5 percent by 1994, this driving the technology very, very hard before studies are completely available before the whole community has climbed the learning curve, rather than getting into an issue of whether rubber is a good idea or a bad idea. Wouldn't it be a good idea, Mr. Baker, just to phase this in a little more gently?

Mr. Baker. I think the answer to that is way beyond my ability to state definitively. But the thing—the example I can point to us Florida and New York, similar time frame, similar request from the legislative and executive side of their State government, approached this issue totally differently.

Florida used the right research, and it is over about a three-year period, they went to NCAT, which is funded by NAPA, they developed a process that solves some paving technologies, and by this fall will be incorporating ground rubber in 100 percent of the Florida DOT surface treatments.

New York at the same time had the same basic mandate, and without consulting with industry, operating in a vacuum, went off on their own and basically said, We don't want this, no one is going to tell us how to build our roads, so we are going to go off and show that rubber and asphalt don't work.

So I guess the question becomes one of who has the responsibility, whose judgments should be used in making these determinations. The Senate and Congress has made that judgment in Section 1038. We believe in it. We support the Congress. And that is where we stand at this point in time.

Mr. CARR. Well, I would just say that I have been in this institution now going on 17 years, and I don't have the confidence in our judgment-making ability, infallibility, the way you do.

Mr. Price?

Mr. PRICE. Thank you, Mr. Chairman.

Mr. CARR. We had the seat belt interlock issue.

Mr. Price?

Mr. BAKER. It is not perfect, but it is better than most.

WORK OF THE STRATEGIC HIGHWAY RESEARCH PROGRAM

Mr. PRICE. Mr. Chairman, I would like to start with Dr. Kulash, whose contribution today I think has been excellent and has helped us get some perspective on this issue.

You have outlined for us very briefly the work of the Strategic Highway Research Program. It is not entirely clear to me what your time frame is in terms of having more definitive findings, more definitive recommendations.

It is also not entirely clear to me to what extent your program has looked at crumb rubber modified asphalt as a research priority; to what extent you have emphasized research on those materials; whether in retrospect it perhaps should have received a greater priority.

In any case, you are saying the five-year research effort has not offered definitive conclusions. So what is the time frame for implementing the kinds of shifts in pavement technology that you are anticipating?

Dr. KULASH. Thank you, Mr. Price.

The time frame looking backward has been over the last six years, we have gone through a major research phase to come up with a set of tests that can be used to measure the performance of asphalt binders and asphalt mixtures in the laboratory, so we can in effect make our mistakes in the laboratory instead of making them in the field. That is where we are at right now. We have developed this ability to test things that way.

What lies ahead is over the next six years, and my organization which developed these tests is now phasing out, over the next six years the Federal Highway Administration, working cooperatively with the States and with industry and with an authorization contained in the 1991 ISTEA, will move forward to help the States and contractors get the necessary test equipment, get the training they need, and actually put these new performance-based tests into applications so they can start using them to choose between all the different materials that they have locally available and the different modifiers that are available on the market.

The second part of your question dealt with the priority we had given to crumb rubber. Our primary priority here was not to any particular material or any particular kind of pavement design: advocates for different pavement designs, advocates for different kinds of binders. We weren't trying to accommodate any particular one of these.

We were trying to come up with an objective tool that States and contractors could use to come up with a good performing design. Depending on what materials are locally available, what the economics are, what the local needs are, they could use our design system and our tests to tell them how any combination of these things would perform.

Now, we were interested in making sure our tools were smart enough to recognize the differences in performance that crumb rubber or other modifiers might make when combined with asphalt. So we did include a little bit of crumb rubber in our test for this purpose. We included a number of other modifiers as well.

Generally speaking, many of the performance claims that are made as to how crumb rubber or other modifiers might improve performance do show up in these test results. These things can help improve performance in certain circumstances.

I think States have recognized this in some applications. For example, many of the rubber modified pavements that have been used have been relatively thin overlays over cracked preexisting pavements, and rubber can be elastic in that application, enough to perform a certain buffering function so those cracks don't go upward to the pavement.

We have not tried to conduct the definitive study of crumb rubber or any other material in our research. We have just tried to come up with some tools that will allow the agencies that build pavements to assess the different options they have in selecting high-performance materials.

TECHNOLOGICAL INNOVATION IN PAVEMENTS

Mr. Price. Now the question arises, how do we best move this program forward, and how do we encourage the kind of innovations, the kinds of new technologies that are going to improve pavement technology in the future?

Now, Mr. Baker has suggested that Section 1038, this kind of statutory requirement in fact will drive that kind of innovation, that kind of progress. You are more skeptical about that.

I wonder if you could elaborate on the reasons for your reservations about this kind of mandate in dealing with one modifier. As I understand your testimony, it might only not push us in the right direction, it might actually be counterproductive.

In your opinion, does the statutory requirement of this sort conflict with the idea of moving toward performance-based design of pavements in this country?

Dr. Kulash. Yes, I believe it does conflict with it, for several reasons. It conflicts in terms of the management transition that is now going on, the process of acquiring new test equipment, training this very large field staff that is necessary to build asphalt pavements, is something that has been under way now to various degrees over the last five years and will continue to go on over the next five.

I think that, in effect, while this long-term performance-oriented process is going on, to lay on a legislative mandate to use some particular material, whether it is a good performing one or bad performing one, is almost beside the question here, is going to interrupt that process.

Here we have been working with agencies, with contractors to try to make wise decisions about what are cost effective and good solutions to the different problems they face, and favoring any particular class of solutions works at cross purposes with that.

Secondly, there is a financial issue, that this is not inexpensive, that the costs of this modifier, like that of most modifiers, raises the price of the binder quite a bit, and in certain applications that can be justified, sometimes when it is in the public interest to pay more and get more. But to come up with an arbitrary legislative percentage as to how much that should be is certainly going to lead you into situations where you are using the material in situations where it is not cost effective.

Mr. Price. Do any of the other witnesses have comments on this line of discussion?

Mr. Baker. A couple of comments along the SHRP line. When you talk about cost, there is actually a project going down in Arizona that actually F&F is doing at this point in time, that is a side-by-side project. The percentage—there are two sections. One deals with the performance-based asphalt, PBA–6. The other deals with an asphalt rubber mixture.

The PBA–6, which is somewhat driven by SHRP, am I right, the performance-based asphalts are driven by SHRP, that material actually costs $350 a ton for the liquid, where the asphalt rubber was quoted on this job at $250 a ton. So here you have got the PBA–6, relatively new, coming into the marketplace, a polymer modified material. It performs similarly to the asphalt rubber, and it is priced $100 a ton above the asphalt rubber.

One of the SHRP sections that—the section I was talking about that I was going to ask Mr. Billings to talk on, I–40, which is up in Flagstaff at about 7,500 feet of elevation, severe, severe weather conditions, chains, hundreds of inches of snow, it was a SHRP test. It has been through three winters and is out-performing all of other SHRP projects put down at the same time on I–40.

So we talk about better roads, and honestly, honestly, the use of rubber in asphalt, if properly designed, properly engineered, and properly placed, is exactly what you are looking for.

It is a very difficult industry out there to try to integrate these ideas. You have States that are very receptive to it and willing to go along with it. You have States that are really resistant to it.

And I think, quite honestly, if you talk to Caltrans or to ADOT, you talk to the administrators there that are far exceeding the requirements of Section 1038 just because of the nature of the beast, they aren't going to support something like this, because they don't want to be told.

I said in my testimony, I mean, I understand the difficulties we have got here. It is a matter of—but people don't want to be told to wear helmets, they don't want to be told about speed limits or seat belts or air quality. I think this is an issue the Congress needs to address and decide what they want to do.

Mr. PRICE. Well, the question, though, Mr. Baker, as I understand it, is not simply whether one agency wants to be told by another or by another level of government what to do. The question also has to do with the merits of the mandate itself and whether it is now warranted by the information base that we have.

I also haven't heard anyone here this morning questioning this kind of anecdotal evidence that you give, these projects that you say have been very promising or have questioned, for that matter, that this crumb rubber modifier will eventually have considerable usefulness.

The question that Mr. Kulash raises, the overall, more extensive, comprehensive kind of research that we know about, whether that really warrants this kind of nationwide absolute mandate at this point.

In other words, what kind of perspective should the instances, the encouraging instances that you cite, be placed in? Can you help us with that?

Dr. KULASH. I think that is right, Mr. Price. I think everyone here would also agree, we should move forward to improve the performance of our pavements and also move forward in incorporating waste materials where that can be done, into the pavements.

Mr. PRICE. That is what your project is all about, right?

Dr. KULASH. That is right. And I think now we do have some tools available that will allow us to make more sensible decisions about crumb rubber, about other modifiers, and about other ways of improving performance and other ways of using waste materials, in the context of each individual job's demands. They vary depending on what kind of aggregates and what kind of climate and traffic that each has.

I think States and contractors are in a much better position to make forward-looking decisions on these things in the years ahead. I think we are also in a better position to address some of the issues raised by the performance of crumb rubber asphalt in a systematic way, as well as addressing some of these other environmental and recycling concerns using some of these new tests and tools.

ALTERNATIVE TECHNOLOGIES

Mr. PRICE. Mr. Chairman, I know we are limited on our time here. This does raise the question about what some of the alternative technologies might be that could be equally promising.

I noticed Mr. Thompson talks about the Europeans developing something called stone-matrix asphalt. By zeroing in on one technology and one kind of modifier, might we be biasing the case against others?

Presumably your research project as it goes now into this second phase would have that broader reach.

Dr. KULASH. That is correct. Stone matrix appears to be a very good material. Many forms of asphalt modification appear to be good in enhancing performance.

Yes, our test would help to give objective information on which of these things work, how much better, and what circumstances, and give agencies a sound basis for making decisions about all of these competing alternatives.

Mr. FRANCOIS. If I might jump in on your question just briefly here. Why concerns about mandates of this type? I think we have just talked about why. When a mandate like this goes into law and carries with it the potentiality of losing up to 20 percent of our highway funds, it is quite obvious that the States are going to give it great attention and focus all their activities on it.

Now, this may be good for the rubber industry. That is fine, and apparently that is how this got into the act. But is it good for the nation's highway system? This is only one possible modifier of hundreds that are used out there.

Is it best in all circumstances for all pavements? That question probably won't be asked if this mandate goes forward, because the States will be forced to use rubber, and of course that is what the industry wants, as the preferred modifier. We will not be analyzing others because we won't have the time to. We will be too busy trying to learn how to use this one.

That is the problem with mandates of that type. There have been other mandates, by the way, some of which have worked and some of which haven't. I remember something called chemcrete that was I believe in the 1992 bill, and it just didn't go anywhere.

In any case, the issue of mandates is that it is taking away the engineering judgments, the capability to make decisions peculiar to a given State's design practices, traffic, weather, available materials, et cetera, et cetera, et cetera.

Mr. WELKE. Mr. Price, there is an old saying in the industry. One good test is worth a thousand experts' opinions. I think Mr. Kulash made that very clear, that we are starting through SHRP to develop performance tests that will measure this. We need some time.

We in the industry, as far as the highway industry, certainly is not against recycling car tires and realize only about 50 or 60 percent of the tire itself can go in the mix. You have to look at all the factors.

We have done microwave. Last year we did a 30,000-ton experimental job in microwaving. We are working on the process. We can't have this ready for us at any level of confidence in the next year or two.

COST IMPLICATIONS OF SECTION 1038

Mr. PRICE. Surely there are times when mandates are appropriate, and where mandates can force us to do things we need to do and to make progress. But it would be a perverse result, to say the least, if a mandate actually stood in the way, if a mandate actually stood in the way of moving toward this performance-based design of pavements, and actually prevented us from exploring the full range of alternatives that have some promise.

The question of cost is critically important. I will just close with a couple of questions in that area. We are talking, of course, about the cost effectiveness of these pavement technologies, and presumably this research effort will help us answer these questions.

Also, the question of how do you dispose of used tires in a cost-effective manner. I don't want to get into this in detail here, because our time is limited, Mr. Thompson, but your testimony does cite a recent publication called Scrap Tire Utilization Technologies.

What is the source of that study?

Mr. MORGAN. Mr. Price, I am Richard Morgan, on the staff of the National Asphalt Pavement Association. We sponsored that study to look at alternate uses for scrap tires, and we published it.

Mr. PRICE. If there is some kind of summary you can furnish for the record, maybe an executive summary of that study that would give us some fix on what some of these alternatives are and the kind of cost figures you place on them. I welcome that from you or any of the witnesses.

Mr. CARR. We have an executive summary. Without objection, it will be made part of the record.

Mr. MORGAN. It is part of our formal testimony, Mr. Price.

Mr. PRICE. Fine.

Finally, Mr. Baker, let me turn again on this cost question. You dispute others' cost figures but you do acknowledge there will be an annual increased cost to using crumb rubber modifier in asphalt.

You estimate $120 million in terms of using crumb rubber in our roads. You offset that against a $72 million savings that you project in landfill costs; is that correct?

Mr. BAKER. That is correct, if you are using the material exclusively as a non-engineering, nonperforming material. But if you use it in an engineering application, we believe that not only is it not a cost, but it is a benefit to the pavement.

And I would like to just for the record quote just a very short piece. This comes from Doug Foresty, Assistant State Engineer for pavements, for materials in Arizona. He said—this is the last sentence of a three-page letter that he wrote to FHWA requesting that asphalt rubber be not classified as an experimental product.

It says, "Continued use of asphalt rubber will provide ADOT with one more proven design method to deal with the plethora of pavement distressed problems. Your continued support of its usage will undoubtedly be in the public interest."

This is a gentleman who has worked with this material for 15 years, a State agency person, and he is requesting the option to use this material.

COST OF PATENTS

Mr. PRICE. Well, the question still arises whether we wouldn't be better off with perhaps less costly, more effective ways of modifying pavement material and finding other ways to dispose of tires.

You know, costing it out in that way isn't terribly helpful unless you know what you are comparing it to, unless you have some kind of sense of what the range of options are.

Specifically, I wonder what kind of assumptions are built into your cost figures about patents. In your testimony, you deal only very briefly with the patent question. Am I to conclude from that there might be some difference of opinion within your association about the patent issue?

Mr. BAKER. The patent issue as far as our association is neutral. We have no opinion on it. The two primary patents on asphalt rubber have expired. They expired in June, in November of 1992.

Because of a variety of issues, including increased competition, the cost of asphalt rubber, which is one of the primary materials being used, has been reduced by probably a factor by about 35 to 40 percent. And I even can document where there are about eight or nine jobs going down in California and Arizona that represent about 15,000 tons of asphalt binder at an average cost of $275 a ton, where the AASHTO survey numbers are using $450 a ton for their mix. So that is a 37.5 percent reduction in the cost of that material, and with some expectations of that material to continue to decline as wider use of the material is shown.

Mr. PRICE. What assumptions are built into your cost figures about whether those patents would in fact be allowed to expire or whether they might be extended? Are you assuming that those patents have expired?

Mr. BAKER. They have expired.

Mr. PRICE. And that there would not be a successful effort to extend them?

Mr. BAKER. In my figures of $30 million, that only includes the material going into the pavement without any engineering value. The asphalt rubber is an engineering valued material. I cannot predict what is going to happen to the patents.

I believe that is the judgment of Congress. If they are going to be extended, they would have to be extended through Congress.

Mr. PRICE. And you are telling me it does not have cost implications?

Mr. BAKER. The patents being extended? I suspect they could, but whether they are going to be extended or not is beyond my control. And I, you know, would think knowing the history of patent extensions, that the possibility of that happening is pretty remote.

I mean, we are just rubber suppliers. We have nothing-my specific company, and we have no interest nor, you know, involvement in the patent material. Obviously, we like to see material prices come down because material prices coming down makes the product more competitive and more widely used.

Mr. PRICE. Well, I still don't have an answer to my question about what assumption you are making about the possible continuation of expired patents or perhaps patents that are pending. Are you making any assumptions one way or the other about that in your cost estimates?

Mr. BAKER. We are assuming that the status quo exists, which means the patents have expired.

Mr. PRICE. You are assuming the expiration of these patents?

Mr. BAKER. Yes.

Mr. PRICE. Are there other critical patents pending that would be relevant to——

Mr. BAKER. I am not aware of any filings of patents myself. I am aware of a couple of companies that are working on new materials, new applications, a lot of it being driven by Section 1038. And as far as I am aware, none of the companies that are doing that are really looking-they are looking at advanced technologies but not necessarily patent material.

Mr. PRICE. All right.

Thank you, Mr. Chairman.

PROCESS OF RECYCLING TIRES

Mr. CARR. Thank you, Mr. Price.

I have just two questions to close with this panel for Mr. Baker. I think it is important to have on the record exactly what happens between the discarding of a tire and the time it is delivered to the asphalt company.

You just don't throw a tire into a mix of asphalt. Something happens along the way. Could you tell so that we all understand for the record what happens.

Mr. BAKER. Best example would be the facility that we are just bringing on line in Mesa, Arizona, as we speak. We take a whole tire, we have collected literally the tires that were generated in Arizona for 1991 and 1992 are on our site, we have 3.4 million on our site.

Mr. CARR. Do you buy those tires?

Mr. BAKER. This was a contract with the State where we went out and actually collected these tires in each county at the disposal site. They paid us a fee breaking the tire even once it arrived at our site.

Mr. CARR. They pay you to come and get the tires?

Mr. BAKER. But by the time you transport the tires, handle the tires, it was basically no cost for raw material at that site.

We then take that tire, it goes through a shredder, a granulator. Magnetic separation occurs all throughout the process, fabric separation occurs throughout the process. The material then goes into what we call a cracker mill. It is sized, further fiber reduction takes place, and the material basically comes out and is packaged. This identical material, as I reported, or similar material, can be different particle-size gradations, are going into literally tens of millions of tires produced in the U.S., in the percentage of 2 to 10 percent of that tire, and we are really only asking for 1 percent in asphalt. It is a highly controlled, high quality controlled process that this material goes through.

Mr. CARR. Now, what does it come out in terms of-

Mr. BAKER. In a ground rubber form, depending on the specific application, the dry process is a little coarser, the wet process is a little finer. The fiber is removed and is used in masticated rubber products and for usually making it into a fiber material, into a woven fiber material that is used in the roofing applications.

The steel is extracted, and 100 percent of that steel is used for making of new steel.

Mr. CARR. What is the rough cost per unit and what is the unit?

Mr. BAKER. The average selling price of this material is approximately 15 cents a pound for different grades of material going into the asphalt industry. Coarser products might be less than 15, finer products might be more than 15, but the average price is 15 cents per pound.

Mr. CARR. The whole process takes——

Mr. BAKER. There are tires constantly flowing in, ground rubber constantly flowing out. It would be like saying, How long does it take a barrel of crude oil to become asphalt. It is a constant process. It represents a significant capital investment.

Mr. CARR. The average transit time would be a half hour?

Mr. BAKER. You know, I mean, there are stages that it goes through.

Mr. CARR. It is not in days or anything like that.

Mr. BAKER. No. The plant will process-the question-the relevant question is, the plant will process, the one we are building in Mesa will process approximately 10,000 tires a day into 120,000 pounds of ground rubber suitable for a variety of applications, of which the asphalt is one of the major applications.

Mr. CARR. Is this plant huge or small?

Mr. BAKER. Sixty five thousand square feet. Some major equipment. Now, this is one of three plants that our company has. There are probably total 10, 12 plants across the U.S., several new companies are getting into this business also.

LEGISLATIVE HISTORY OF SECTION 1038

Mr. CARR. You mentioned in your testimony the legislative history here. I wonder if you can enlighten us in a little more detail about the legislative history of section 1038. How did it get there?

Mr. BAKER. I personally wasn't involved, from the very beginning. It was one of the driving forces of Senator Chafee from Rhode Island, and there was a compromise between the House and the Senate side.

Our involvement as an association was to remove the material from experimental classification so it would qualify for firm funding. And there were people within Congress who wanted some minimal utilization requirement, and the two were put together, and you have the legislation.

Mr. CARR. I am a little curious about the legislative history for the minimum utilization requirement. Can you enlighten us on that at all?

Mr. BAKER. Well——

Mr. CARR. I wish I was in the conference and didn't have to ask you these questions, but I wasn't. How did we arrive at 5 percent——

Mr. BAKER. Senator Chafee was involved in a RCRA bill prior to this, and that was kind of spun out of that RCRA legislation. And quite honestly I think the best place to learn this would be from Senator Chafee, because he was the driving force.

And, you know, I don't have any problems telling you all I know. I just don't know enough to tell you. I think it would be better coming from Senator Chafee.

Mr. CARR. I find myself in the same situation. I go to my constituents and taxpayers and say, I wish I knew all the answers to your questions.

INTERNATIONAL COMPARISONS

Mr. **Price**. Mr. Chairman, I am going to have to leave, and since I am not going to be here for the full second panel, I do want to just raise one issue, probably with Mr. Kulash, very briefly, that I had hoped to raise with the second panel. That has to do with the extent to which we have an international perspective on this challenge.

We have all heard the claims that Europeans build more durable roads than we do in the United States. I don't know if those claims are accurate or not. But to what extent are we looking internationally as we have done the preliminary stages of this research, and are now in the testing phase? Are we comparing our technologies with those that have been proven in other countries?

Dr. **Kulash**. Yes, we are, to an extent I believe that has not been characteristic of the field throughout most of its history.

Within SHRP, for example, we have had tremendous international interest. Twelve different countries have sent people to work with us for a period of one year at their own expense, and there are some 40 individuals who have come in that capacity. So we have had 40 people provided by various foreign laboratories in the SHRP program.

I think the reason for this is many of these issues are ones that agencies throughout the world are grappling with. You have heard about stone-matrix asphalt, a very good performing materiality.

There is a lot of modification of asphalt binder in France and some other European countries. They use it, I believe, to a greater extent than most of our agencies do because they have gained some greater comfort with the performance advantages of that material. We have learned about their testing techniques and some of the performance advances through them.

The short answer is, yes, this has been, I think, combined with all this. A number of industry and Federal and State officials went on a study tour to look at European asphalt pavements two or three years ago and came back fairly excited about some of the investments they saw there as well.

So I believe there is a good exchange of technology. There has never been more international technical exchange in this area than there has been in the last five years.

Mr. **Baker**. If I could, Mr. Price, here is a NAPA document that speaks about the tour that NAPA, FHWA took two or three years ago. And I would like to submit this for the record.

It does mention in here two or three times the use of rubber in pavements, also in conjunction with stone matrix that you were talking about. I would like to submit this for the record.

Mr. **Carr**. We will put it in the file. The Committee is well aware of that report. It has been the topic of a number of hearings. So it will be appropriately referenced.

[Clerk's note.—NAPA document entitled, *Call to Action,* European Asphalt Study Tour, 1990]

Mr. **Morgan**. Mr. Chairman, on the legislative history, there was a RCRA bill, a tire disposal type of bill. It had a trust fund to it initially, a Federal trust fund. It wasn't too dissimilar from Torres'—one of his initiatives. It got put into the highway bill. It was a tire disposal bill as opposed to a performance enhancer bill. At the risk of being accused by my friend at the left of more NAPA misstatements, but that is really where it started.

CLOSING REMARKS

Mr. CARR. I want to thank all of you for the time and attention you have given to educate the Committee on this important topic and to further our education process.

WEDNESDAY, MAY 12, 1993.

CRUMB RUBBER MODIFIED ASPHALT

SECOND PANEL OF WITNESSES

DR. WILLIAM FARLAND, DIRECTOR, OFFICE OF HEALTH AND ENVIRONMENTAL ASSESSMENT, U.S. ENVIRONMENTAL PROTECTION AGENCY

DR. JON EPPS, DEAN, COLLEGE OF ENGINEERING, UNIVERSITY OF NEVADA-RENO

CARL C. JACOBSON, JR., PRESIDENT, INTERNATIONAL SURFACING INC.

E. DEAN CARLSON, EXECUTIVE DIRECTOR, FEDERAL HIGHWAY ADMINISTRATION

INTRODUCTION OF SECOND PANEL

Mr. CARR. We will call to the witness table Dr. William Farland, Director, Office of Health and Environmental Assessment, U.S. Environmental Protection Agency; Dr. Jon Epps, Dean, College of Engineering, University of Nevada-Reno; Mr. Carl C. Jacobson, Jr., President, International Surfacing Inc.; and an old friend of the Committee, a fellow who has done an exemplary job of leading the agency at a time when there is no politically-appointed head of the agency, Mr. Dean Carlson, Executive Director of the Federal Highway Administration, a person who has logged quite a few hours in this hearing room.

Dr. Farland, why don't you lead off and give us the benefit of your best wisdom.

STATEMENT OF WILLIAM FARLAND

Dr. FARLAND. Thank you, Mr. Chairman. I am William Farland, Director of the Office of Health and Environmental Assessment in Research and Development at the EPA. My office has major responsibility for risk assessment activities in support of many of the EPA's program offices.

I am pleased to have the opportunity to testify before you on the topic of human health and environmental assessment of the production and use of asphalt pavement containing recycled rubber.

You have heard from others about the requirements of Section 1038 for joint work between EPA and DOT to determine the threat to human health and the environment associated with production and use of asphalt pavement containing recycled rubber.

Our report will be delivered to the Congress next month. This report will address aspects of the act which allowed the Secretary of Transportation to set aside provisions of the subsection requiring minimum utilization requirements for asphalt pavement containing recycled rubber, if, in concurrence with the Administrator of the EPA, the Secretary finds there is reliable evidence indicating that manufacture, application or use of asphalt pavement containing recycled rubber substantially increases the threat to human health or the environment as compared to the threats associated with conventional pavement.

It also deals with the issue of recylcability and the issue of performance, both of these issues you have heard about this morning.

My testimony focuses only on the first of these issues. By conventional definition, risk is a function of both hazard and exposure, and in evaluation of, quote, "threats" needs to consider all of these issues.

Our determination as to any health or environmental threats will be based on answers to two questions. Is the inherent toxicity of emissions from asphalt containing recycled rubber substantially increased over that of emissions from asphalt itself? Are the emissions from asphalt containing recycled rubber substantially increased over those from conventional asphalt?

In accordance with the act, the operative word in both of these questions is the word "substantial." In answering both questions, we are looking at ranges of emissions and toxicity profiles for the materials being compared since different asphalt compositions, operating conditions, and a variety of other factors may influence both the level of emissions and the mix of constituents.

In our evaluation, we will be considering these questions. Does current information allow us to answer both the questions that I have posed, and does the information point to a potential for substantial increase in health hazard that needs further research?

Asphalts used for paving are produced by refining petroleum crude oils. You have heard from others a discussion about some of the chemical composition issues, but let me just say that the chemical composition for asphalt varies greatly depending upon the origin of the crude oil and the processes used during refining.

Clearly there is already a considerable body of information on the toxicity of the constituents in asphalt emissions. Asphalts are known to contain and emit many hazardous constituents. Polycyclic organic matter and in particular the PAHs are commonly mentioned as groups of hazardous constituents in asphalts.

Much information is already known about the toxicity of many of the PAHs. Many them are known mutagens and have been found to produce skin tumors in animals.

Workers exposed to PAH mixtures such as coke oven emissions and emissions from roofing tar, are known to have increased risks for lung cancer. Many of the known carcinogenic PAHs, in particular benzo[a]pyrene, have been reported in asphalt itself and in its emissions.

Other classes of hazardous emissions of asphalts are VOCs, which contain such chemicals as benzene, benaldehyde alkylated benzenes, naphthalene and alkylated naphthalenes. Benzene itself is a known human carcinogen. Rubber also contains hazardous constituents.

Against this baseline of information on asphalt, we are looking to see if substitution of some percent of paving material with recycled rubber will change the toxicity profile substantially for the worse.

In addition to its evaluation of individual compounds contained in these complex mixtures I have just described, the agency has identified seven studies which provide some information regarding comparison of the composition of emissions of conventional asphalt with emissions from asphalt containing recycled rubber. Two of the studies were conducted by the Ontario's Ministries of Transportation and the Environment. Two were conducted by the Texas Department of Transportation. One was conducted in New Jersey by the New Jersey Department of Transportation. One was conducted in California by the Asphalt Rubber Producers Group, examining exposure to workers. One was conducted in California by the National Asphalt and Paving Association.

It should be noted that six of the studies have not yet been made available to the general public as published studies with final conclusions and have not been extensively peer reviewed.

Each study was conducted using unspecified asphalt chemical compositions. Furthermore, within these studies the analytical procedures varied, the plant configurations and emissions controls varied, and different operating conditions probably occurred during the comparisons.

Also, the quality control and assurance of the data collected has not been yet confirmed by the EPA, and in some cases the amount of asphalt binder used in the conventional mixes was different from that used in mixes containing recycled rubber.

Thus, the comparisons must be viewed with some qualification and not as definitive values that can be replicated with precision in future studies.

In addition, it should be noted that a great amount of variability can be observed in most of the chemical analyses observed within the studies. There is even greater variability observed when trying to make comparisons of cross studies.

Our preliminary view is that emissions from either conventional asphalt or from asphalt containing recycled rubber can vary widely both in the profile of emissions observed and in the levels of contaminants released. We see no trends of significantly increased or decreased emissions attributable to the use of recycled rubber in the asphalt. Emissions from asphalt itself are known to be hazardous.

Current data do not show that emissions from asphalt containing a few percent recycled rubber are substantially more hazardous for asphalt workers or the general population than emissions from asphalt itself. Between now and next month, we will be further examining our views and the data for our report to Congress.

This concludes my prepared remarks. I will be pleased to respond to any questions that you might have.

[The prepared statement and biography of William Farland follows:]

TESTIMONY OF
WILLIAM H. FARLAND, PH.D.
DIRECTOR, OFFICE OF HEALTH AND
ENVIRONMENTAL ASSESSMENT
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON TRANSPORTATION AND RELATED AGENCIES
OF THE
COMMITTEE ON APPROPRIATIONS
U.S. HOUSE OF REPRESENTATIVES

MAY 12, 1993

Mr. Chairman and members of the Subcommittee; I am Dr. William Farland, Director of the Office of Health and Environmental Assessment in the Office of Research and Development. This Office has major responsibility for risk assessment activities in support of many of the Environmental Protection Agency's (EPA) program offices. I am pleased to have the opportunity to testify before you on the topic of the human health and environmental assessment of the production and use of asphalt pavement containing recycled rubber.

Section 1038(b) of the Intermodal Surface Transportation Efficiency Act of 1991 (Act) directs the Administrator of the Environmental Protection Agency to coordinate and conduct a study to determine the threat to human health and the environment associated with the production and use of asphalt pavement containing recycled rubber, and, conduct jointly with the Secretary of Transportation and in cooperation with the states, a study to determine, among other things, the threats to human health and the environment and the environmental benefits of using recycled materials in highway devices and appurtenances and highway projects, including asphalt containing over 80 percent reclaimed asphalt, asphalt containing recycled glass, and asphalt containing recycled plastic. A report on our findings will be delivered to the Congress next month. The Act allows the Secretary of Transportation to set aside the provisions of the subsection requiring minimum utilization requirements for asphalt pavement containing recycled rubber if, in concurrence with the Administrator of the Environmental Protection Agency, the Secretary finds that there is reliable evidence indicating: (1) that manufacture, application, or use of asphalt pavement containing recycled rubber substantially increases the threat to human health or the environment as compared to the threats associated with conventional pavement; (2) that asphalt pavement containing recycled rubber cannot be recycled to substantially the same degree as conventional pavements; or (3) that asphalt pavement containing recycled rubber does not perform adequately as a material for the construction or surfacing of highways and roads.

Our determination as to any health or environmental threats will be based on the answers to two questions: (1) Is the inherent toxicity of emissions from asphalt containing recycled rubber substantially increased over that of emissions from asphalt itself? (2) Are the emissions from asphalt containing recycled rubber substantially increased over those from conventional asphalt? In accordance with the Act, the operative word in both questions is the word substantial. In answering both questions, we are looking at ranges of emissions and toxicity profiles for the materials being compared since different asphalt compositions, operating conditions, and a variety of other factors may influence both the level of emissions and the mix of constituents.

In our evaluation, we will also be considering these questions: Does current information allow us to answer the above questions? and Does the information point to a potential for substantial increase in health hazard that needs further research?

Asphalts used for paving are produced by the refining of petroleum crude oils. The chemical composition varies greatly depending upon the origin of the crude oil and on the processes used during refining. The International Agency for Research on Cancer (IARC) described asphalts as complex mixtures containing a large number of different compounds of relatively high molecular weight.

Question of Toxicity

Clearly, there is already a considerable body of information on the toxicity of the constituents of asphalt emissions. Asphalts are known to contain and emit many hazardous constituents. Polycyclic organic matter (POM) and in particular the polycyclic aromatic hydrocarbons (PAHs) are commonly mentioned as groups of hazardous constituents of asphalts. Much information is already known about the toxicity of many of the PAHs. Many of them are known mutagens and have been found to produce skin tumors in animals treated by skin painting. Workers exposed to PAH mixtures such as coke oven emissions and emissions from roofing tar are known to have increased risks of lung cancer. Many of the known carcinogenic

PAHs, in particular benzo[a]pyrene, have been reported in asphalt itself and in its emissions.

Other classes of hazardous constituents of asphalts are the volatile organic compounds (VOCs), which contain such chemicals as benzene, benzaldehyde, alkylated benzenes, naphthalene, and alkylated napthalenes. Benzene is a known human carcinogen.

Against this baseline of information on asphalt, we are looking to see if substitution of a few percent of paving material with recycled rubber will change the toxicity profile substantially for the worse.

Question of Emissions

The Agency has identified seven studies which provide some information regarding comparison of the composition of emissions of conventional asphalt with emissions from asphalt containing recycled rubber. Two of the studies were conducted by the Ontario Ministries of Transportation and the Environment, two were conducted for the Texas Department of Transportation, one was conducted in New Jersey for the New Jersey Department of Transportation, one was conducted in California for the Asphalt Rubber Producers Group examining exposures to workers, and one was conducted in California by the National Asphalt and Paving Association. It should be noted that six of the studies have not yet been made available to the general public as published studies with final conclusions, and have not been extensively peer reviewed. Each study was conducted using unspecified asphalt chemical compositions. Furthermore, within studies, the analytical procedures varied, the plant configurations and emissions controls varied, and different operating conditions probably occurred during the comparisons. Also, the quality control and assurance of the data collected has not been confirmed by EPA, and, in some cases, the amount of asphalt binder used in the conventional mixes was different from that used in the mixes containing recycled rubber. Thus, the comparisons must be viewed with some qualification and not as definite values that can be replicated with precision. In addition, it should be noted that a great amount of variability can be observed in most of the chemical analyses observed within the studies. There is even greater variability observed when trying to make comparisons between studies.

Our preliminary view is that emissions from either conventional asphalt or asphalt containing recycled rubber can vary widely both in the profile of emissions observed and in the levels of each contaminant released. As a preliminary matter, we see no trends of significantly increased or decreased emissions attributable to the use of recycled rubber in the asphalt. Emissions from asphalt itself are known to be hazardous. Current data do not show that emissions from asphalt containing a few percent recycled rubber are substantially more hazardous for asphalt workers or the general population than emissions from asphalt itself. Between now and next month, we will be further examining our views and the data.

This concludes my prepared remarks. I will be pleased to respond to any questions you may have.

BIOGRAPHICAL INFORMATION
FOR
WILLIAM H. FARLAND

DOCTORATE FROM UCLA (1976) IN CELL BIOLOGY/BIOCHEMISTRY SPECIALTY: NUCLEIC ACID AND NUCLEOTIDE METABOLISM

NATIONAL CANCER INSTITUTE RESEARCH SERVICE AWARD TO PURSUE STUDIES ON HUMAN ENZYMES INVOLVED IN DNA REPAIR AFTER UV OR CHEMICAL DAMAGE - 3 YEARS AT BROOKHAVEN NATIONAL LABORATORY

CAME TO WASHINGTON, D.C. IN 1979 TO TAKE A JOINT APPOINTMENT AT THE GEORGE WASHINGTON UNIVERSITY MEDICAL SCHOOL AND AT THE ENVIRONMENTAL PROTECTION AGENCY - OFFICE OF TOXIC SUBSTANCES

CONTINUED RESEARCH AND ASSESSMENT OF MECHANISMS AND IMPLICATIONS OF GENETIC DAMAGE AND ITS REPAIR ON THE CARCINOGENIC PROCESS AND ON DEVELOPMENTAL TOXICITY

PREVIOUSLY, ACTING DIRECTOR, HEALTH AND ENVIRONMENTAL REVIEW DIVISION WITH MAJOR RESPONSIBILITIES IN THE ASSESSMENT OF EFFECTS OF NEW CHEMICAL SUBSTANCES - PMNs

DIRECTOR, CARCINOGEN ASSESSMENT GROUP (CAG) AND ACTING DIRECTOR REPRODUCTIVE EFFECTS ASSESSMENT GROUP AND CHARTER MEMBER OF THE AGENCY'S RISK ASSESSMENT FORUM

CONTINUED INTEREST AND INVOLVEMENT IN THE DEVELOPMENT OF NATIONAL AND INTERNATIONAL GUIDANCE FOR THE TESTING AND ASSESSMENT OF CHEMICAL FATE AND EFFECTS

PRESENTLY, DIRECTOR, OFFICE OF HEALTH AND ENVIRONMENTAL ASSESSMENT

STATEMENT OF JON EPPS

Mr. CARR. Thank you, Dr. Farland. We appreciate your testimony and your being here.

Dr. Epps?

Mr. EPPS. Mr. Chairman, I am pleased to be here to summarize the results of a study which I am completing for the Transportation Research Board under the National Cooperative Highway Research Program I participated in. The Transportation Research Board is a major unit of the National Research Council, which, in turn, is one of the operating agencies of the National Academy of Science.

A panel has been appointed to review this work, although the comments I make today will represent my feelings and nobody else's at the present time, since this has not been thoroughly reviewed.

With your permission, I have prepared a written report for the record. I will summarize.

Mr. CARR. Thank you. Your full statement and report will be part of the record.

Mr. EPPS. The use of waste tires and highway applications has a long history. Recent legislation at the Federal and many State level legislative activities has renewed the highway community's interest in using larger quantities of waste tires and highway applications. At present, the largest use of waste tires in highways is a source of rubber in asphalt, although many other uses, as discussed today, have been utilized.

The use of scrap tire rubber and asphalt mixtures extends over a period of 30 years. Documentation of this work, while extensive, is somewhat disjointed and is thus difficult to summarize.

Several types of binders are produced by combining waste tire rubber and asphalt. As discussed previously, crumb rubber modifier is a general type of asphalt modifier which contains scrap tire rubber. Modified asphalt-paving products can be made with crumb rubber modifier or by a number of other techniques, including a wet and dry process.

The wet process has been used historically for a long period of time as well as certain types of dry processes. I will not attempt to summarize the details of that at the present time.

The properties of crumb rubber modified asphalt binders are dependent upon a number of factors including the type and concentration of rubber and the diluent that may or may not be contained in these binders. Also, the time and temperature are important parameters.

There are three major uses that asphalt rubber modified materials have been used for. These include chip seals, interlayers and hot mixes, of which we have talked about some today.

The development of asphalt rubber binders for chip seal applications was started in the streets in Phoenix in the 1960s. This has led to a lot of developments. The first display applications in large quantities were in 1968 with poor results. Techniques have been developed, however, to spray applications of asphalt rubber materials, and are practiced on a daily basis throughout this country.

The materials that are produced by this process, that is, the application of an asphalt rubber material, and application of aggregate, is called a stress-absorbing membrane and has been used since the early 1970s.

The performance of asphalt rubber chip seals based on this literature review, which contains reference to some 500 pieces of literature, has been from poor to good compared with chip seals made with conventional binders. This variation in performance can be partially attributed to design and control problems. Quality control should be to provide better performance.

Reflection cracking, that is, the transfer of traction of material under a seal coat through the seal coat itself, is not substantially reduced with asphalt rubber binder systems. Some projects have noted improved performance while others have shown no improvement performance at all.

Typically, first cost increases based on the existing literature are from 50 to 100 percent for asphalts rubber chip seals relative to conventional chip seals. Life cycles, therefore, must be nearly doubled for equal life-cycle costs for chip's seals made with asphalt rubber binders.

Costs of asphalt rubber binders are expected and indeed have decreased in the future. The magnitude of this decrease is certainly not known at the present time.

The second major application historically has been in the area of interlayers, and these are materials that are placed in terms of application of asphalt rubber binder and aggregate between an old pavement and a new pavement. Arizona Department of Transportation placed its first stress-absorbing membrane interlayer in September of 1972. A significant number of miles of pavement containing SAMs have been placed in a number of States from this time period forward.

A performance of asphalt rubber interlayers is highly variable. It ranges from poor to good on various types of control sections. Interlayers placed under overlays on either poured and cement concrete pavements or asphalt concrete pavements containing transverse cracks have not been effective in reducing reflective cracking.

The reflection of alligator cracking, which is caused by distress, has been reduced from when asphalt rubber interlayers were used on a number of experimental sections throughout the country.

Typical cost increases containing asphalt rubber interlayers or SAMs are from 1.5 to 2.5 times the cost of conventional sections. Life cycles of pavements therefore must be about twice those of conventional sections in order to have a cost-effective solution. Again, asphalt rubber binders are expected to decrease in the future.

Crumb rubber modifier hot-mix materials have been used since the 1960s. Hot mixers have contained binders prepared from both the wet and the dry process, and have been used in dense, open and gap-graded materials. A survey of the Asphalt Rubber Producers Group indicates that 35 projects were placed between 1975 and 1987 in some 12 States. This use has continued to increase since 1987.

The performance of crumb rubber modified hot mixes has very varied greatly. Those mixtures made with asphalt rubber binders, the wet process in general, have performed overall better than those made with the dry process. Some studies have indicated a reduction in the occurrence of reflection cracking and good performance at reduced thickness—the California situation, to be specific.

Typical cost increases have been in the range of 50 percent to 100 percent. Life cycles of pavements, therefore, must approach the twice limit to become effective again.

The use of asphalt rubber binder materials in recycling operations has been discussed, I think, previously to today. I will be happy to comment on that in terms of questions, but I will not read a prepared statement on that.

Asphalt rubber joint and crack sealers are widely used in the United States. A questionnaire used to collect data for this particular synthesis indicates that 13 States use asphalt rubber routinely as a joint sealer, four States use it experimentally as a joint sealer.

Use of asphalt rubber as a crack sealer is more widespread. Seventeen States use the material routinely and six experimentally at the present time.

A number of joint and crack sealant experimental field projects have been performed in the United States, but only a few have used asphalt rubber in formal comparison studies. Limited data are available which define the cost and performance of asphalt joining crack sealers. Studies report vary greatly. The average effectiveness, however, appears to be relatively high as substantial quantities of asphalts are used for this particular purpose.

The environmental impacts and health risk, I think, have been discussed by the previous speaker. I will just indicate that a number of States, again, plan studies this summer in order to address this issue more fully.

There is a number of conclusions and recommendations which are contained in the drafts of the synthesis and I have those contained in the record for your review at a later date. But I would like to have a few concluding comments, if I may.

Before we can safely begin any major paving program using crumb rubber modified asphalt, we need to learn more than we know today about its properties, its durability, its life-cycle cost, and its impact on man and the environment. While my written report contains many recommendations, again, I will just summarize a few of these.

Number one: Desirable binder properties for chip seals, interlayers, hot mixes and joint and crack sealers must be better defined with existing or new tests such as those in SHRP before we can go ahead and develop these materials in a very confident method in terms of engineering qualities and quantities. Additional studies will have to be performed to determine the recyclability of pavements containing these binders.

Number two: Improved mixture design methods must be developed for hot-mix applications. The new SHRP mixture tests need to be performed. Design guides and manuals need to be developed which will speed this implementation and will define the techniques and provide guide specifications for these mix designs.

Three: Field quality control and quality assurance methods must be developed to ensure that desirable binders and mixture properties are being achieved. Detailed life-cycle cost analyses need to be performed on a properly selected process. Comparisons with preliminary or modified binders need to be made using controlled sections as well as comparisons with typical binder systems.

Number four: Carefully controlled experimental field sections must be placed in different climactic sections of the United States to gain data on performance. Binder mixture and binder properties must be determined and performance defined for extended periods of time. Performance and cost information on these field sections need to be documented and distributed widely.

Five: Additional field emission studies and additional laboratory and field leachate studies need to be conducted. Health and safety training courses needs to be developed and delivered to the work force as necessary. Both environmental impact and health consequences, I believe, need more research.

That concludes my statement.

[The prepared statement of Jon Epps follows:]

TESTIMONY

before
U.S. House of Representatives
Transportation Appropriations Subcommittee of the
Public Works and Transportation Committee
May 12, 1993

by
Dr. Jon A. Epps, Dean
College of Engineering
University of Nevada-Reno

Mr. Chairman and Members of the Committee, I am Jon A. Epps, Dean of the College of Engineering at the University of Nevada at Reno. I am pleased to be here today to summarize the results of a study which I am completing for the Transportation Research Board (TRB) under the National Cooperative Highway Research Program (NCHRP). The National Cooperative Highway Research Program is a major research program sponsored jointly by the states, in cooperation with the American Association of State Highway and Transportation Officials (AASHTO), and the Federal Highway Administration (FHWA). The Transportation Research Board is a major unit of the National Research Council, which, in turn, is the operating arm of the National Academy of Sciences and the National Academy of Engineering. The opinions or findings, expressed or implied, that I present today are my own, and are not necessarily those of the Transportation Research Board, the National Research Council, the National Academy of Sciences, the Federal Highway Administration, or the American Association of State Highway and Transportation Officials.

This study is a Synthesis of Highway Practice, Topic 22-02, entitled "Uses of Recycled Rubber Tires in Highways." A Synthesis is part of an ongoing NCHRP project to search out and summarize useful knowledge from all possible sources and to prepare a documented report of current practice on a particular subject of concern to transportation officials; a Synthesis is not, therefore, original research. A panel of experts, selected from state highway departments, the Federal Highway Administration, university research organizations, and industry is appointed by TRB to guide the Synthesis project and to review the report drafts. The draft, reporting the findings that I will discuss today, has not yet been reviewed by the panel.

This Synthesis on "Uses of Recycled Rubber Tires in Highways" was initiated prior to passage of the Intermodal Surface Transportation Efficiency Act. At that time several state legislatures had directed state highway agencies to investigate the use of recycled rubber tires in highway construction, and several other states were considering similar actions due to the increasing numbers of scrap tires accumulating in many parts of the country. The purpose of the Synthesis is to address what uses are now made or contemplated for recycled rubber tires by state highway agencies and to report both successful and unsuccessful experiences.

Although the draft Synthesis report is still being revised, I can comment on some of the findings to date.

INTRODUCTION

The synthesis of information is based on a review of nearly 500 references and a survey of current state highway agency practices. The synthesis addresses the uses of rubber tires in asphalt paving materials as well as other uses including geotechnical and traffic operations. Various applications are identified together with design parameters, technical and construction limitations, performance, costs, environmental limitations, specifications, current research and criteria, research needs, and legislative issues.

Over 242 million scrap tires, or approximately one tire per person, are generated each year in the United States. This steady stream of new scrap tires plus the 2-3 billion waste tires that have accumulated in stockpiles or uncontrolled tire dumps and the millions of tires scattered in ravines, deserts, forests, grasslands and empty lots create a significant disposal problem. Presently about 17 per cent of the waste tires, which are about 2 per cent of this country's solid waste are used for 1) combustion, 2) whole tire applications and 3) processed tire products.

The use of waste tires in highway applications has a long history. Recent legislation at the federal and state levels has renewed the highway community's interest in using larger quantities of waste tires in highway applications. At present, the largest use of waste tires in highways is as a source of rubber in asphalt. Other uses of waste tires in highway applications include: fills and embankments, erosion control, retaining walls, membranes, slope protection, safety hardware, railroad crossings, valve box coverings, planks and posts, drainage aggregate, and culverts.

The long term use of waste tires in highway applications will depend upon economic, engineering, environmental, health, and safety considerations associated with the various end products.

USE IN ASPHALT PAVING MATERIALS

The use of scrap tire rubber in asphalt mixtures extends over a period of 30 years. Documentation of this work while extensive is somewhat disjointed and thus it is difficult to summarize and to establish defensible conclusions. Several types of binders are produced by combining waste tire rubber and asphalt. The literature contains a multitude of terminology to describe these binder systems. Often the same or similar binder system is identified by more than a single term.

The 1992 Federal Highway Administration publication on this topic contains terminology that appears suitable and that will most likely gain acceptance by the users and producers of these binders (Figure 1).

"Crumb rubber modifier (CRM)" is a general type of asphalt modifier which contains scrap tire rubber. Modified asphalt paving products can be made with crumb rubber modifier (CRM) by a number of techniques including a "wet process" and a "dry process". The products resulting from these processes may contain other than scrap tire rubber. Other types of rubbers, polymers, diluents and aromatic oils may also be used to develop asphalt based-binders which have a wide range of properties.

WET PROCESS

The "wet process" describes the construction process that blends the crumb rubber with asphalt cement prior to use in spray applications, as a binder in a hot mix at a central plant process or as a prepackaged joint or crack sealer. The asphalt cement and crumb rubber are typically reacted at high temperatures and diluents, aromatic oils and/or polymers may be added. The resulting binders from this type of process have been commonly referred to as asphalt rubber or "reacted" system in the literature and have been used extensively in the United States.

DRY PROCESS

The "dry process" describes the construction process when the crumb rubber is added to a hot mix at a central plant operation prior to the addition of the asphalt cement to the aggregate. The "dry process" is used in hot mix asphalt dense, open, and gap graded mixtures. Other names for this mixture:

1. rubber modified hot mix asphalt
2. asphalt concrete rubber-filled
3. non-reacted system
4. rubber modified asphalt cement

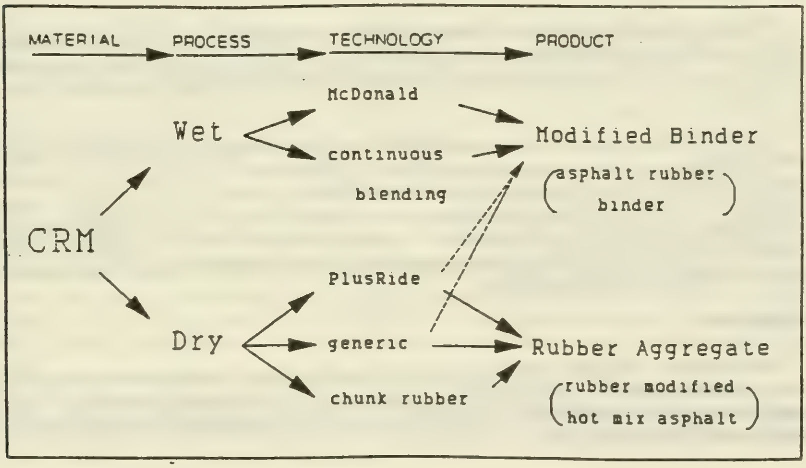
OTHER METHODS

Increased concern and legislation relative to the use of tires in asphalt binders for pavement applications has led to the development of other concepts for using rubber in asphalt. These new concepts are commonly referred to as the generic dry process, chunk rubber asphalt concrete, and continuous blending asphalt rubber.

Generic Dry Technology

As the name implies, this is a dry process used to produce dense-graded hot mixtures. The concept involves a more detailed mix design and uses the idea of selecting both coarse and fine crumb rubber to match aggregate gradings and to achieve improved binder modification over conventional dry processes. A prereaction or pretreatment of crumb rubber with a catalyst may be needed to achieve the optimum crumb rubber particle swelling. Experimental pavement sections have been placed in New York, Florida and Ontario.

Figure 1: The Relationship of Crumb Rubber Modifier (CRM) Terminology and Technology (after Reference F34)



5/11/93

Chunk Rubber Asphalt Concrete

The U. S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (USA-CRREL) investigated the dry process, crumb rubber modified mixtures for debonding ice on pavements. Crumb rubber larger than the No. 4 sieve with a dominant size of 3/8 inch was used.

BINDER PROPERTIES

INTRODUCTION

Crumb rubber modified binders in use today have largely evolved from original concepts developed by McDonald, U.S. Rubber Reclaiming, and the dry process concepts developed in Sweden. The state of Arizona has been heavily involved in asphalt rubber binder research as well as Sahuaro, ARCO and CRAFCO in the United States. Australia, Canada, South Africa and Sweden have also contributed to this knowledge base. A historic view of this development together with details on the properties of crumb rubber modified binders is contained in the Synthesis.

SUMMARY

The properties of crumb rubber modified asphalt binders are dependant upon a number of factors; including the type and concentration of rubber and diluent, and the time and temperature of reaction. The addition of other polymers will also alter the properties of the resultant binder systems.

Wet processed crumb rubber modified binders are usually reacted at temperatures and over periods of time that produce reasonably stable binder properties. Dry processed crumb rubber modified binders are only partially reacted.

CHIP SEAL COATS

INTRODUCTION

The development of asphalt rubber binders for chip seal coat applications is associated with McDonald, Sahuaro and ARCO as previously indicated. McDonald's "band-aids" placed on the streets in Phoenix in the 1960's were the first chip seals placed. These seals were placed by hand over a limited area of the pavement.

A major problem arose when asphalt rubber binder was applied through an asphalt distributor rather than with hand equipment. Slurry seal equipment was used on a limited basis to apply the binder. Unsatisfactory installation resulted in modification of the asphalt rubber binder by reducing the crumb rubber content and adjusting the viscosity with diluents to allow the use of a specially designed asphalt distributor. The first spray application was in 1968 with poor results. A project was placed with a slurry machine in 1969. In 1970 the first project using a diluent (kerosene) was placed. These chip seal coat applications became known as Stress Absorbing Membranes (SAM).

SUMMARY

The performance of asphalt-rubber chip seals has ranged from poor to good relative to chip seals made with conventional binders. This variation in performance can be partially attributed to design and construction quality control problems. Improvements in asphalt rubber binder properties and quality control should provide better performance.

Reflection cracking is not substantially reduced with asphalt rubber binder systems. Some projects have noted improved performance while other projects show no improvement.

Typically, first cost increases by 50 to 100 percent for asphalt rubber chip seals relative to conventional chip seals. Life cycles, therefore, must be nearly doubled for equal life-cycle costs for chip's seals made with asphalt rubber binders. Costs of asphalt rubber binders are expected to decrease in the future. There is not enough cost information to predict, with any degree of confidence, the magnitude of the price decrease.

INTERLAYERS

INTRODUCTION

Asphalt rubber binders for use as interlayers were developed by McDonald, Sahuaro, and ARCO. Asphalt rubber chip seals which were overlaid with hot mix asphalt are known as a Stress Absorbing Membrane Interlayer (SAMI).

Arizona DOT placed its first stress absorbing membrane interlayer in 1972 as part of a project to evaluate techniques to reduce reflection cracking. From a historical approach the SAMI development followed the SAM development. A significant number of miles of pavement containing SAMI's were placed in Arizona. Several other states have placed asphalt rubber interlayers over the years.

SUMMARY

The performance of asphalt rubber interlayers is highly variable and ranges from poor to good relative to various types of control sections. Interlayers placed with overlays on portland cement concrete pavements are not very effective in reducing reflection cracking. Asphalt rubber interlayers placed on asphalt concrete pavements which contain transverse cracks are likewise not very effective in preventing reflection cracks. Data are available which indicate that the reflection cracks on pavement sections containing asphalt rubber interlayers are not as severe and are not in need of as frequent maintenance as compared to control sections. The reflection of alligator cracking has been reduced when asphalt rubber interlayers were used.

Typical cost increases for pavement sections containing asphalt rubber interlayers are 1.5 to 2.5 times the costs of conventional sections. Life cycles of pavements containing asphalt rubber interlayers must be doubled for equal life-cycle costs. Costs of asphalt rubber binders are expected to decrease over time, though the extent and rate of the decrease are unpredictable.

HOT MIX ASPHALT

INTRODUCTION

Crumb rubber modified hot mixes have been used since the 1960's. Hot mixes have contained binders prepared from both the wet process and dry process. Historically, Sahuaro, ARCO, Crafco, International Surfacing and others have supplied the asphalt rubber binder for hot mix applications. The binder for dry process or rubber modified hot mixes has been supplied by PlusRide or placed into hot mixes by public agencies.

Dense, open, and gap graded hot mix asphalts have been made from these binders. A survey by the Asphalt Rubber Producers Group indicates at least 35 projects of this type were placed between 1975 and 1987 in 12 states. Use has expanded in more recent years.

SUMMARY

The performance of crumb rubber modified hot mixes has varied greatly. Those mixtures made with asphalt rubber binders (wet Process) have better overall performance than those mixtures made with rubber asphalt (dry process). Some studies have indicated a reduction in the occurrence of reflection cracking and good performance at reduced thickness.

Typical cost increases (without a reduction in thickness) for mixtures containing crumb rubber modifiers are 50 to 100 percent over typical conventional mixtures. Life cycles of pavements containing asphalt rubber modified hot mixes must be approximately doubled for equal life-cycle costs. Costs of crumb rubber modified asphalt is expected to decrease in the future, though the extent and rate of the decrease are unknown.

RECYCLING

The process for selecting materials for pavements should include an assessment of the recyclability of the material and pavement layer in which it is used. Asphalt rubber binders when used in pavement materials should be capable of being recycled.

Three field recycling projects have been completed to date. No laboratory studies have been conducted. One field project was performed in France, another in Ontario, Canada, and a third in New Jersey.

Hot In-place Recycling in France

A six year old open-graded friction course which lost its permeability due to silting was recycled with hot in-place equipment. This process was successful in that it established the desirable void content and permeability in the pavement and was able to alter the binder properties with a recycling agent. Environmental, health and safety concerns were not addressed in this report, making an overall evaluation of the process difficult.

Hot Central Plant Recycling

A dry process, crumb rubber modified test section was placed in Ontario in 1990 and recycled in 1991. A hot central plant process developed by Boeing was used for recycling. Results from this project have not been published at the time of preparation of this synthesis; however, a presentation was made at the 1993 Annual Meeting of the Transportation Research Board. Stack tests, area tests and personnel testing was conducted on this experimental project. The report will be available sometime in 1993. Hot in place recycling is also scheduled for the project. No conclusions can be drawn until further information is available.

New Jersey has recycled a dry process, crumb rubber modifier project. Details are not available.

JOINT AND CRACK SEALERS

INTRODUCTION

Asphalt rubber joint and crack sealers are widely used in the United States. The questionnaire used to collect data from state highway authorities as part of this study indicates that 13 states use asphalt rubber routinely as a joint sealer, 4 states use it experimentally, and 1 state proposes utilization of the product. Use of asphalt rubber as a crack sealer is more widespread. Seventeen states use the material routinely, 6 experimentally, and one state has use pending.

A number of joint and crack sealant experimental field projects have been performed in the U.S. but only a few have used asphalt rubber in formal comparison studies. Because of the wide acceptance of asphalt rubber as a crack sealer, most public agencies feel that a life cycle cost advantage exists when they use asphalt rubber products.

SUMMARY

Limited data are available which define the cost and performance of asphalt-rubber joint and crack sealers. Studies report varied performance with asphalt rubber. The average effectiveness appears to be relatively high. Substantial quantities of asphalt rubber are used for this purpose.

OTHER HIGHWAY USES

INTRODUCTION

Chopped, shredded and whole tires have been used for a number of other transportation related uses. These uses include: fills and embankments, erosion control, retaining walls, membranes, slope protection, safety hardware, railroad crossings, valve box coverings, planks and posts, drainage aggregate, and culverts.

The states of Arizona, California, Colorado, Connecticut, Indiana, Louisiana, Maine, Minnesota, North Carolina, Oregon, Pennsylvania, Rhode Island, Texas, Vermont, Washington and Wisconsin indicate that they have made use of tires for one or more of these types of applications. Results of documented projects are presented in the synthesis.

SUMMARY

Chopped, shredded and whole tires have been used in several fills and embankments. Results to date have been encouraging. These types of applications have the potential to use large quantities of waste tires. The use of tires in these types of applications may have some effect on the environment. Studies completed to date have given mixed results for tires placed below the water table.

The use of tires for erosion control is fairly well established in a number of states. California's design guides are useful for these types of applications. Concerns relative to visual acceptance by the public, and cost, need to be addressed.

A wide variety of other uses and potential uses have been identified in the literature. Promising uses include retaining walls, membranes, safety hardware, railroad crossings, valve box coverings, planks, posts, drainage aggregate, and culverts.

ENVIRONMENT, HEALTH AND SAFETY

INTRODUCTION

The environmental impacts and health risks associated with using waste tires in highway structures has been raised by several states. The states of California, Colorado, Minnesota, Vermont and Wisconsin have concerns relative to the use of waste tires as subbase fill materials, erosion barriers, and retaining walls. Many states and other individuals have concerns relative to emissions associated with the manufacture, placement and use of crumb rubber modified binders for both new construction and for recycling operations. Pavements that are placed should be able to be recycled without encountering environmental, health and safety problems.

Literature on environmental, health and safety issues is limited to date.

LEACHATE STUDIES

Six leachate studies have been conducted and reported in the literature. A laboratory and field study conducted in Minnesota appears to be the most detailed information available. This information and the limited work conducted in Vermont and Wisconsin is summarized in the synthesis.

EXPOSURE OF WORKFORCE TO EMISSIONS

Workforce exposure studies were conducted in southern California over a 2.5 year period and reported by Dan Napier and Associates to the Asphalt Rubber Producer Group. Workers at the asphalt rubber mixing site and at the application or paving site were monitored. Blender operators, laborers, roller operators, rakers, paver operators, screen operators, bootman, aggregate (chip) spreader operators, and aggregate spreader beltmen were sampled on seven different projects.

Samples were obtained on chip seal and membrane projects as well as asphalt rubber hot mix projects by use of portable personal sampling equipment consisting of a filter-holding assembly and a battery operated pump. Testing was conducted by use of NIOSH and OSHA methods for the determination of selected emission components.

SUMMARY

Leachate studies conducted in the laboratory and in the field indicate the potential for environmental problems. One state will not allow the use of waste tires in surface waters or below the water table.

Soil samples taken at waste tire stockpiles indicate that non-organic chemicals are not elevated when compared with background soil samples. The stockpile areas may contain higher petroleum hydrocarbon concentrations than background soils.

A limited number of emission studies have been conducted. Since exposure limits for asphalt fumes have not been established health effects are difficult to establish.

CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations contained in this section of the synthesis are based on a review of the literature and input received from the synthesis topic panel. Conclusions and recommendations are provided for general topics associated with waste tire disposal as well as for the use of crumb rubber in asphalt paving materials, other highway uses and environmental, health and safety.

GENERAL

The disposal of waste tires in the United States is a significant problem even though it represents only about 2 percent of the solid waste stream. Current and proposed legislation will continue to direct the development of waste tire recycling. The long term use of waste tires will depend upon economic, engineering, environmental, health, and safety considerations associated with the various end products produced.

CONCLUSIONS

1. The waste tire stream is 242 million per year or approximately one tire per-person-per-year. The quantity will increase.

2. Two to three billion waste tires have accumulated in stockpiles or uncontrolled dumps.

3. The use of tires as a fuel source is expected to increase in the future.

4. Portable tire shredders, splitters or cutters will become more plentiful in the near future. This will reduce the costs of transportation and the cost of landfill disposal.

5. Federal and state legislation will continue to charge the state and local authorities to more aggressively use waste tires in highways.

RECOMMENDATIONS

1. Public policy and legislation should be formulated to allow for the transfer of tire "waste disposal fees" to state highway agencies for use in research and development efforts as well as to offset the increased first costs of using tires in highway applications.

2. Training programs need to be developed and delivered which provide engineering guidance for proper use of waste tires in highway applications.

CRUMB RUBBER IN ASPHALT PAVING MATERIALS

Crumb rubber has been used in asphalt paving materials since the 1960's. Its use in chip seals, interlayers, hot mix asphalt and joint and crack sealers has been relatively slow to develop because of 1) first cost, 2) lack of good engineering data which would predict performance of these binder systems and 3) field performance information to support life cycle cost estimates.

As with any new engineering material, changes have been made in its formulation which affects performance. Thus some performance information is reported on binder systems that are no longer used. Reported first costs for crumb rubber modifier binders are higher than costs to be expected in the future because of mobilization, quantity and contractor familiarization with the product. First costs will probably reduce in the future as quantities increase and as more cost effective methods are developed to include rubber in asphalt binders.

CONCLUSIONS

1. Crumb rubber modified asphalt binders can be produced by either the wet or dry process.

2. It is possible to use crumb rubber modified asphalt binders successfully in chip seals, interlayers, hot mixes and for joint and crack sealers; however, field performance of crumb rubber modified asphalt binders used for these purposes has been mixed. This performance variability is due in part to poor design, project selection, and field quality control.

3. The properties of the crumb rubber modified asphalt binders are dependent upon the rubber type, size, and concentrations; asphalt type and concentration; diluent types and concentration; and reaction temperature and time.

4. Chip seal and interlayer applications have not been successful in reducing the occurrence of transverse and longitudinal reflection cracks in asphalt pavements.

5. Chip seals and interlayers have not been successful in stopping reflection cracks in portland cement concrete pavement overlays.

6. Adequate quality control and quality assurance methods have not been developed to ensure that the desired binder properties are obtained in the field.

7. Crumb rubber modified asphalt binders do not appear to be cost effective at current prices for a number of applications in a variety of climates. While the cost of CRM asphalt is likely to decrease, it is not possible to predict the time required for development of cost effective approach for a wide variety of applications.

RECOMMENDATIONS

1. Desirable binder properties for chip seals, interlayers, hot mixes, and joint and crack sealers must be better defined with existing or new tests. Crumb-rubber modified asphalt binders will need to be developed which contain these properties.

2. Improved mixture design methods must be developed for hot mix applications. The new SHRP mixture tests need to be performed on hot mixes containing wet and dry processed binders.

3. Field quality control and quality assurance methods must be developed to ensure that desirable binder and mixture properties are being achieved.

4. Carefully controlled experimental field sections must be placed in different climate regions in the United States to gain data on performance. Binder and mixture properties must be determined, and performance defined over a 5 to 30 year period for these projects.

5. Detailed life cycle costs analysis need to be performed based on available information. Comparisons need to be made with control sections and polymer modified binders.

6. Crumb rubber modified binders are used routinely in several states for specific rehabilitation activities. These applications need to be carefully defined, and information about them presented to other public agencies.

7. Additional studies must be performed to determine the recyclability of pavements containing crumb rubber modified asphalt binders.

8. Additional research is needed to define the properties of binders produced by both the wet and dry processes.

OTHER HIGHWAY USES

Waste tires have been successfully used for a number of non-pavement, highway applications. These uses have the potential to use large quantities of tires.

CONCLUSIONS

1. Chopped, shredded and whole tires have been successfully used for a limited number of highway related applications including fills, embankments, erosion control devices, slope protection, safety hardware, and membranes.

2. The quantity of tires used for these applications is presently small. Large quantities of scrap tires can be potentially used in fills and embankments.

3. Performance information on these uses is not well documented.

4. Cost of these uses is not well documented.

5. Environmental, health and safety issues relative to the use of waste tires for these applications needs further research.

RECOMMENDATIONS

1. Design guides and manuals need to be developed which define these uses and provide guide specifications for the work to be performed.

2. Performance and cost information on these uses needs to be documented.

3. Construction techniques need to be developed which will allow for lower cost installation.

ENVIRONMENT, HEALTH AND SAFETY

Leachate studies conducted in the laboratory and field indicate the potential for environmental problems. The limited number of emission studies conducted to date need to be expanded and exposure limits need to be established.

CONCLUSIONS

1. Leachate studies conducted with tires in low and high pH water environments indicate that a number of metals and organic material can be leached. The concentrates of these metals and organics exceed certain health standards. These laboratory leachate tests represent "worst case" conditions, and surface waters generally provide a large dilution factor.

2. Field leachate studies have provided mixed results. Some studies have indicated higher metal and organic concentrations than exist in control sections.

3. A Minnesota study suggests that potential environmental impacts from the use of waste tires in fills and embankments can be minimized by placement of tire materials only in unsaturated zones. (above ground water table)

4. An insufficient number of studies on work-force exposure have been conducted to draw a firm conclusion on this issue.

RECOMMENDATIONS

1. Additional laboratory and field leachate studies need to be conducted.

2. Additional field emissions studies need to be conducted.

3. Health and safety training courses need to be developed and delivered to the work force.

STATEMENT OF CARL JACOBSON

Mr. CARR. Thank you, Dr. Epps. Most helpful.

Mr. Jacobson, you enlightened us a little bit during the previous panel.

Mr. JACOBSON. I almost feel like the donkey that is hanging on the birthday party with all the blind-folded kids with pins ready to stick into it.

Mr. CARR. Don't feel that way. We are just looking for the truth here.

Mr. JACOBSON. That is the only thing I know.

Mr. CARR. All right.

Mr. JACOBSON. It seems to me that all engineers come from Missouri and have to be shown. All academics want to study something to death. That is the way this looks.

I would like to start by talking a little bit about this call to action that was put out by the FHWA and NAPA on their tour of Europe, where they extolled the virtues of European pavement. It says, "The United States should swallow our pride. Asphalt pavements are not as good as Europe's asphalt pavements."

Then it says, "Caution: U.S. can't hit the ground running with European ways."

They go on to talk about stone-matrix asphalt. On page 3 they say that what is flip matrix asphalts? Higher binder contents, 6.5 to 7 percent. Higher binder contents using mineral, cellulose and ground rubber.

They go on on the next page, they talk about modifying asphalt cements for better pavement by adding ground rubber. They talk about ways to improve our roads. In European communities it is not unusual for contractors to have three to five years warranties on their pavements.

The recommendations are, encourage the use of guarantees, recommend Federal aid projects to require contractors to guarantee surfaces.

My name is Carl Jacobson. I am President of International Surfacing in Chandler, Arizona. I have been involved in technologies which incorporate recycled tire rubber and pavements and crack sealants since 1970.

I have been asked to give a brief history and explanation of the use of asphalt rubber and to discuss the status of patents on this project.

First I will tell you how the patents came to be. In the mid-1960s, an engineer in the City of Phoenix was searching for better methods of patching and repairing streets. His first experiments began in 1964 with small patches and crack repairing. This process continued experimentally until he arrived at a product that was flexible and resisted cracking. He applied for a patent and was granted it in 1975.

The commercial aspects of the material were being promoted from an engineering standpoint on the merits of the material. The merits of the material was that, as it was being used at that time, was to form a flexible membrane over old existing pavement surfaces and glue it together.

When combined with aggregate, asphalt rubber provided a surface that was more durable and would last longer. In the City of Phoenix and the State of Arizona, it has provided maintenance-free service that has lasted more than 20 years.

Also in the 1970s products were in effect using asphalt rubber as a binder for asphalt binder surfaces. Because of the flexibility of the rubber and the UV inhibitors that kept the tires from deteriorating, this made a product that resisted cracking and aging.

The use of asphalt rubber as a crack sealant material has been used and accepted in every State. In 1980, the State of Pennsylvania began a preventive maintenance crack program that is saving the State $30 million a year in their maintenance program today.

In 1976, the FHWA was instrumental in passing a requirement that the material would be regulated to be experimental for the life of the patents.

In spite of this, research and development continued, and the methods of using asphalt and rubber and the equipment for the implementation of its use were improved. Numerous small projects were placed in at least 36 States.

In 1991, with the signing of the Intermodal Surface Transportation Efficiency Act, the requirement that asphalt rubber remain experimental was removed by legislative action.

Because of the frustrations of trying to provide a product to the highway industry for which Federal funding was not available except as experimental projects, the suppliers of the product elected to give guarantees on performances of the product. They were informed again that it was against the Federal regulation to allow a warrant or guarantee on highway paving products.

Because of perseverance and expense incurred by the patent holders, a paving material has been developed which will extend the life of our roads by as much as five times. The results of experiments that have been tried in numerous States have shown that it can be used in thinner layers than conventional pavement with better the results.

In 1992, the California Department of Transportation issued A Design Guide for Asphalt Rubber Paving that allows 50 percent reduction in thickness when compared to conventional paving.

In a 1991 letter to the Federal Highway Administration Region 9, Doug A. Forstie, Arizona Assistant State Engineer, requested permission to continue use of asphalt rubber, a patented, proprietary material, on Federal aid projects. He stated that 20 years of research has shown that asphalt rubber was a superior, cost-effective material.

Cost comparisons from actual projects showed that two inches of asphalt rubber was the same cost as three inches of conventional asphalt paving, but that the two inches of asphalt rubber out-performed four inches of conventional paving.

From a report entitled "Criteria for Asphalt Rubber Concrete in Civil Airport Pavements," DOT, FAA, PM-86/39.11, commissioned by the FAA, page 39 shows that asphalt rubber is five to eight times better than conventional pavement in resisting cracking. On page 96, four to five times better for resisting rutting. And page 106, life-cycle cost per square yard per year showed that asphalt rubber is one-eighth the cost of conventional payment on life cycle.

This is a Federal study that was commissioned by the FAA, published in 1987.

If asphalt rubber is used properly, pavements of the United States will last considerably longer and will perform better than European pavements, which use was extolled by the FHWA, and I talked a little bit about the European study they were talking about.

This technology was exported to Europe in the late 1970s. They picked up on it in Germany. It is called Flooster asphalt. In Italy, asphalt silencioso.

It is amazing to me that AASHTO was spending money and time to discourage the use of a material that was proven to extend the life of roads and make them safer. I can understand the paving industry would resist a new paving material in which paving thicknesses can be reduced by 50 percent and the paving will last three to five times longer. They feel this would be a threat their ongoing existence, and some day we will run out of roads to pave.

The thing overlooked by this method of thinking is that there are a lot of roads that could be paved but are not due to lack of funding. Also overlooked in the fervor of trying to suppress this product are the added features that it reduces noise level on interstate freeways by as much as 78 percent and on city arterial streets by as much as 88 percent.

For every mile of pavement paved with asphalt rubber, between 1,000 and 5,000 tires are being removed from the waste stream. They are crying that emissions are harmful and detrimental to the environment without any research or documentation to substantiate their claims.

The truth is quite contrary. There are less emissions from asphalt rubber than from conventional asphalts paving.

The question has been asked of me, why are we pursuing an extension of patents that relate to this process? The property rights of the United States allow the inventor, 17 years after a process is developed and no longer classified as experimental, to develop and recover the cost of research and development of their products.

The entire reason that this product has gained so much attention is because of the success of the experimental projects that were placed around the country between 1975 and today.

The restrictions that were placed by Federal regulation that classified this product as experimental prevented the patent holders access to the large market that is available under the Federal funding for highways and streets.

Nearly all highways constructed in cities, counties and States with the exception of maintenance has a percentage of Federal funding involved in it.

If this attitude towards patented products was extended to all products, a patented AIDS-HIV cure would not be able to be used for medicare patients.

In a recent NAPA publication, Gordon Penick, NAPA Chairman of the Board, stated, and I quote, "Some supporters of asphalt rubber have claimed that NAPA and HMA industry have been negative in their attitude towards their product on the grounds that the addition of rubber would extend pavement life and it would reduce the industry's markets because longer-lasting pavement wouldn't require overlays as often. I have two words to describe my reactions to this, neither of which we can put into print."

I say that those words he couldn't put into print are, that is true. That is their reason for fighting this.

I sat face to face from a prominent NAPA member who said, We will fight to our dying day to keep out a paving material that can be used with 50 percent reduction in thickness and will last three to five years longer.

In a reprint from Readers Digest, from the Washington Monthly, I can't read the fine print, I would like to quote, "One reason that France like many other European countries has made a concerted effort to build roads for the long haul, the French mix their asphalt with quality additives such as rubber, carbon, and polyethylene. The Europeans also make use of new technologies.

"Unfortunately, innovation doesn't seem to be a high priority with American road builders, and the millions of frustrated American drivers can't hold a candle to the powerful road-building lobby.

"Smart Federal policy reform requires lifting the ban on guarantees, ditching low-bid requirements, encouraging States to loosen up their material specs, allowing contractors to use the best material and the best designs.

"The consensus among private corporations seems clear. Transferring their technology to the public sector takes too long, too much time, too much money and too much energy, thanks to the absurd way the system is set up. Absurd."

I would like to close my remarks by reading a letter from Fife Symington, the current Governor of the State of Arizona, if I can find it.

This is to Larry Bonine, Director of Arizona Department of Transportation. "Dear Larry: As you know, in accordance with Section 1038 of the Intermodal Surface Transportation Efficiency Act of 1991, Arizona and all other States will soon be required to use recycled rubber in 5 percent of our asphalt-paving projects. Arizona has long been a leader in using recycled rubber in our paving projects. Since the technology was developed in our State back in the 1960s, rubber asphalt has been used on more than 10 percent of Arizona's highways. Not only does it lead to longer-lasting pavements, it has also enabled us to make significant strides in reducing the number of used tires in our landfills.

"In light of this, I would like to see Arizona exert its traditional leadership in utilizing asphalt rubber and exceed the Federal requirement. Although the Federal requirement increases by 5 percent per year until reaching 20 percent in 1997, Arizona's experience in the field would allow us to stay ahead of this requirement by at least 5 percent a year. Arizona's commitment to recycling and to recycling-related businesses such as the new tire recycling facility in Mesa must not waiver.

"I am proud of ADOT's historical role in helping to develop asphalt rubber technology and look forward to seeing even greater results, as we take advantage of this later opportunity."

Thank you.

[The prepared statement of Carl Jacobson follows:]

TESTIMONY OF CARL C. JACOBSON

PRESIDENT, INTERNATIONAL SURFACING INC.

BEFORE THE

HOUSE APPROPRIATIONS SUBCOMMITTEE ON TRANSPORTATION

MAY 12, 1993

My name is Carl C. Jacobson and I am president of International Surfacing, Inc. in Chandler, Arizona. I have been involved in technologies which incorporate recycled tire rubber in pavements and crack sealants since 1970. I have been asked to give a history and explanation of the use of asphalt rubber, and to discuss the status of the patents on this product.

First, I would like to give a brief history of how the patents came to be. In the mid-1960's, an Engineer for the City of Phoenix, Mr. Charles McDonald, was searching for a better method of patching and repairing streets. His first experiment began in 1964, with small patches and crack repairing. This process continued, experimentally, until he arrived at a product that was flexible and resisted cracking. He applied for a patent and was granted this patent in 1975.

The commercial aspects of the material were being promoted from an engineering standpoint, on the merits of the material. The merits of the material as it was being used at that time were to form a flexible membrane over the old existing pavement surface and glue it together. When combined with aggregate, asphalt rubber provided a surface that was more durable and would last longer. In the City of Phoenix and in the State of Arizona it has provided maintenance-free surfaces that have lasted for more than 20 years.

Also, in the 1970's, projects were in effect using this asphalt rubber as a binder for asphalt concrete surfaces. Because of the flexibility of the rubber and also the UV inhibitors that were there to keep the tires from deteriorating, this provided added improvements to the asphalt paving, making a product that resisted cracking and aging. The use of asphalt rubber as a crack sealing material has been used and accepted in every state. In 1980 the State of Pennsylvania began a Preventative Maintenance Crack Sealing Program that is saving the state in excess of 30 million a year in their Maintenance Program.

In 1976, the FHWA was instrumental in passing a requirement that this material would be regulated "experimental" for the life of the patents. In spite of this, research and development continued, and the methods of using asphalt and rubber and the equipment for the implementation of its use were improved.

Numerous small projects were placed in at least 36 states. In 1991, with the signing of the Intermodal Surface Transportation Efficiency Act, the requirement that asphalt rubber remain "experimental" was removed by legislative action. Because of the frustrations of trying to provide a product to the highway industry for which Federal funding was not available, except as "experimental projects", the suppliers of the products elected to give guarantees on the performance of the product. In 1992 they were informed, again, that it was against the Federal regulations to allow a warranty or guarantee on highway paving products.

Because of perseverance and expense incurred by patent holders, a paving material has been developed which will extend the life of our roads by as much as five (5) times. The results of experiments that have been tried in numerous states have shown asphalt rubber pavement can be used in thinner layers than conventional asphalt pavement, with better results.

In February 1992 California Department of Transportation issued a design guide for asphalt rubber paving that allows 50% reduction in thickness when compared to conventional asphalt paving.[1]

In a 1991 letter to the Federal Highway Administration, Region 9, Doug A. Forstie (Arizona Assistant State Engineer) requested "permission to continue the use of asphalt rubber, a patented, proprietary material on Federal aid projects."[2]

He stated that 20 years of research has shown that asphalt rubber was a superior cost effective material. Cost comparisons from actual projects showed that 2" of asphalt rubber was the same cost as 3" of conventional asphalt paving. But, 2" of asphalt rubber performed better than 4" of conventional paving.

From a report entitled "Criteria for Asphalt Rubber Concrete in Civil Airport Pavements"[3], DOT FAA/PM-86/39.11, commissioned by the FAA, Page 93 shows that asphalt rubber is 5 to 8 times better than conventional pavement resisting cracking; from Page 96 - 4 to 5 times better for rutting; from Page 106 - life cycle cost per square yard per year shows that asphalt rubber is 1/8 the cost of conventional pavement.

If asphalt rubber is used properly, the pavements of the United States will last considerably longer and will perform better than the European pavements, which use was extolled by the FHWA and AASHTO after their tour of Europe, where they found that "pavement superiority could be ascribed to an investment in an amount three (3) times greater than that in the United States due to implementation of better technology and emphasis on quality." It was also stated that the European companies were using innovative proprietary paving materials. The FHWA published a paper at the Transportation Research Board which encourages development of European methods of building better roads in the U.S., yet the policies of our current transportation departments try to curtail innovative paving materials and products that will make our pavements last longer.

In a summary of the European Asphalt Study Tour, entitled "Call to Action"[4], published by NAPA, I quote from Page 2 - "Swallow our pride, accept that U.S. asphalt pavements are not as good as Europe's asphalt pavements"; from Page 4 - Add ground rubber to increase binder content for better roads; from Page 5 - "Modify asphalt by adding ground rubber"; from Page 8 - "Recommend Federal aid projects requiring contractors to guarantee wearing surfaces for 5 years."

It is amazing to me that AASHTO is spending money and time to discourage the use of a material that has proven to extend the life of roads and make them safer. I can understand a paving industry that would resist a new paving material in which paving thicknesses can be reduced by 50% and the paving will last three (3) to five (5) times longer. They feel this would be a threat to their ongoing existence, and that some day we will run out of roads to pave. The thing overlooked by this method of thinking is that there are a lot of roads that could be paved, but are not, due to lack of funding. Also overlooked in the fervor of trying to suppress this product are the added features that it reduces noise level on Interstate freeways by as much as 78%[5] and on City arterial streets by as much as 88%[6]. Additionally, for every mile of pavement that is paved with asphalt rubber, between 1,000 and 5,000 tires are being removed from the waste-stream.

The opponents of asphalt rubber are crying that asphalt rubber emissions are harmful and are detrimental to the environment, without any research or documentation to substantiate their claim. The truth is quite the contrary. There are less emissions from asphalt rubber than from conventional asphalt paving[7].

The question has been asked of me, "why are we pursuing an extension of patents that relate to this process?" The property rights of the United States allow an inventor 17 years after a process is developed and is no longer classified as experimental, to develop and recover the costs of research and development for their products.

The entire reason that this product has gained so much attention is because of the success of the experimental projects that were placed around the country between 1975 and now. The restrictions that were placed by the Federal Regulation that classified this product as experimental, prevented the patent holders access to the large market that is available under the Federal funding for highways and streets. Nearly all highway construction in Cities, Counties, and States, with the exception of maintenance, has a percentage of Federal funding involved in it.

If this attitude towards patented products was extended to all products, a patented AIDS-HIV cure would not be able to be used for Medicare patients.

In a recent NAPA publication[8], Gordon Penick, NAPA Chairman of the Board, stated, and I quote, "Some supporters of asphalt rubber have claimed that NAPA and the HMA Industry have been negative in their attitude toward their product on the grounds that the addition of rubber would extend pavement life and that would reduce the Industry's markets because longer-lasting pavements wouldn't require overlays, etc. as often. I have two words to describe my reaction to this, neither of which we can put into print." I say the two words are that's true. I sat face-to-face with a prominent NAPA Board member when he said "We will fight until our dying day to keep out a paving material that can be used with 50% reduction of thickness and will last 3 to 5 times longer."

I would now like to read to you a letter that was recently written by the Arizona Governor, Fife Symington[9]. As the "Tucker" car is to the automobile industry, "Asphalt Rubber" is to the paving industry. I urge you to support Section 1038 and to not accept all of the negative comments made about "Asphalt Rubber". The proof of the pudding is in the eating.

END NOTES

1 Earl Shirley (California, Division of New Technolgoy, Materials and Research) letter February 28, 1992 to All District Directors.

2 Douglas A. Forstie, Arizona DoT, August 21, 1991 letter to Edward A. Wueste, USDoT, FHWA.

3 Criteria for Asphalt-Rubber Concrete in Civil Airport Pavements. Tables 22, 23, 25, 26, and 27. Denise M. Hoyt, Robert L. Lytton, Freddy L. Roberts.

4 Call to Action. European Asphalt Study Tour, 1990.

5 Janet R. Gruner and Adel J. Assaf (Western Technologies) April 19, 1990 letter to Gene Morris, International Surfacing.

6 Janet R. Gruner and Adel J. Assaf (Western Technologies) April 5, 1990 letter to Joe Cano, City of Phoenix.

7 Exposure of Paving Workers to Asphalt Emissions (When using Asphalt-Rubber mixes). Grace Rinck and Dan Napier.

8 "Chairman's Corner", NAPA newsletter, Focus/Spring, 1993. Gordon F. Penick.

9 Fife Symingtron, Governor of Arizona, April 29, 1993 letter to Larry Bonine, Arizona DoT.

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Western Technologies, Inc., Janet R. Gruner and Adel J. Assaf letter to Gene Morris, International Surfacing, April 19, 1990.

Western Technologies, Inc., Janet R. Gruner and Adel J. Assaf letter to Joe Cano, City of Phoenix, April 5, 1990.

ASPHALT RUBBER MATERIAL SAMPLE

Mr. CARR. Thank you, Mr. Jacobson. I like guys like you, I really do. Some of the hearings we have would be spiced up a good bit. You have some show and tell items there that you didn't talk about.

Mr. JACOBSON. I am glad you asked. I would just like to show you a sample of asphalt rubber as it is used as a crack sealant material and why it makes such a good binder in pavement. This particular product has about 20 percent tires. You can see how tough it is. Plus, it resists change.

This particular piece here is a section out of a piece of pavement in the City of Phoenix. A very thin asphalt rubber overlay was put on a conventional pavement. This thin overlay was one inch or less, as you can see by the yellow stripes that show through from the previous pavement. After it had been in place for two years, a couple of stress cracks showed on the top. And they wanted to find out what was happening. This is what was underneath it. They had about an inch and a half gap underneath this.

If this were one inch of conventional pavement, this would have been a pot hole in two years. This one, today, after four years, doesn't look any different than what you have right here. You can actually go in with a thinner layer and have your pavement surface last much longer than your conventional pavement.

In fact, in the City of Phoenix, they have shown that one inch of asphalt rubber will out-perform two inches of conventional when laid over petromat, which was the Philips Petroleum Super Bowl ad. You probably saw the guy from Oklahoma who said his pavements were better because he put it over his petromat and it didn't crack. But in actual side-by-side tests, one inch of asphalt rubber with no inner layer has out-performed two inches of AC over petromat.

Mr. CARR. Thank you, Mr. Jacobson.

Dean Carlson.

STATEMENT OF DEAN CARLSON

Mr. CARLSON. Mr. Chairman, thank you for your introduction and to have the Federal Highway Administration testify on our efforts to implement section 1038. We are working very hard to fulfill the requirements in ISTEA regarding recycled pavement materials, attempting to ensure their use meets all proper worker health, environmental and pavement performance standards.

There has been a lot of testimony that I will try not to go over very much, on the wet process, the dry process, one developed in Phoenix, Arizona, one in Sweden. There are a lot of things out there. And we have been trying to work on this technology transfer program for crumb rubber material since the early 1970s.

Many States have used these programs to design and build experimental projects with varying degrees of success. A lot of States are currently evaluating projects using rubber-modified asphalt and rubber-modified hot-mix asphalt mixtures.

We cosponsored three seminars on these materials in the 1980s and continue to provide technical support to the States and industry on the use of crumb rubber technology. We have also issued many publications on crumb rubber, including "State of the Practice, Design and Construction of Asphalt Paving Materials with Crumb Rubber modifier," in May of 1992, and crumb rubber modifier workshop notes in January of 1993.

Now, the ISTEA requirements are really very different for us, because they do include mandates. There are three issues to be resolved, and FHWA defers to EPA on the health and environmental aspects of this, including their definition of what a substantial concern would be.

We look at the construction techniques and the performance that are in the second and third parts of the three that we are to look at. And we are looking closely at this with EPA.

EPA is conducting that part of the study concerning the health and environmental effects of the pavement. And the study also will examine the use of other waste materials in pavements.

The FHWA and EPA have formed a study coordination group to develop and do whatever research is necessary to undertake the studies required by Section 1038(b). We are near completion of the study and we are working with the EPA to develop a synthesis for all available information from the study.

We plan to continue evaluating long-term performance and recycling capability of rubber-modified asphalt. We expect to complete the study by the June 18th, 1993 deadline.

To date, the EPA has found no firm scientific evidence to suggest that the use of rubber-modified asphalt presents greater environmental or health risks than regular asphalt paving material.

In order to assist the States and industry in implementing this legislation, we have held several workshops in locations across the country. More than 1400 agency representatives attended these meetings. I think they were pretty well received by the agency and the industry.

We have responded to over 40 requests for presentations from AASHTO and State DOTs on the crumb rubber material technology. They provide technical support in preparation for the minimum utilization requirements beginning in 1994 and will continue to respond to these requests.

Along with EPA, we are also developing a program for a national symposium on the use of waste materials in highway paving. This symposium is to cover the new state of the practice in this area, and is scheduled for Denver, Colorado, from October 19th to the 22nd of this year. We have at least 50 papers that have been submitted for presentation at the meeting.

But several issues, some of which have been discussed, have certainly been raised by Section 1038. There have been concerns expressed about the increased initial costs posed by conversion to rubber-modified asphalt.

Preliminary indications are that the costs for crumb rubber materials modification exceeds the current costs for standard asphalt mixes by 20 to 100 percent, depending on the type of process used.

Furthermore, with the exception of a handful the States, experience with asphalt pavements has been limited to a few experimental test sections or less. Many States have expressed reluctance to use crumb rubber material widely without more experience with the technology.

We are going to continue through our workshops, publications and technical support to at least try to get as much knowledge out there as we can.

The addition of crumb rubber to asphalt will require modifications to paving contractors' equipment. Many suppliers of asphalt pavement are very small businesses and they are concerned about their ability to recoup the cost of this additional equipment and still remain competitive. They are also concerned that as this additional technology is in the developmental stage, equipment bought this year may become obsolete rather quickly.

Finally, State agencies and paving contractors are concerned by the lack of long-term performance data. Early uses of crumb rubber-modified asphalt occurred primarily in the Southeastern United States and concentrated on surface treatments.

The use of crumb rubber and hot-mix asphalt did not begin until the late 1970s. As a result, there is not really very much long-term performance data available for evaluating cost effectiveness of asphalt pavements containing crumb rubber, certainly not enough to suggest that we should use the waiver provisions of Section 1038.

FHWA has made major efforts through our workshops, publications and technical support to prepare the States and the paving industry for the advent of ISTEA's rubber-modified asphalt requirements.

We, along with EPA, are working to find solutions to the concerns expressed by the States and the industry as a result of beginning widespread use in 1994. We are going to continue to work with EPA in order to complete the study required by Section 1038 by the June 18th deadline.

Thanks for the opportunity to be here. I will be happy to answer any questions.

[The prepared statement of Dean Carlson follows:]

STATEMENT OF E. DEAN CARLSON
EXECUTIVE DIRECTOR
FEDERAL HIGHWAY ADMINISTRATION
U.S DEPARTMENT OF TRANSPORTATION
BEFORE THE
HOUSE APPROPRIATIONS COMMITTEE
SUBCOMMITTEE ON TRANSPORTATION
MAY 12, 1993
USE OF RECYCLED PAVING MATERIAL

Mr. Chairman, Members of the Committee, thank you for providing me the opportunity to appear before you to provide testimony on the Federal Highway Administration's (FHWA) efforts to implement the provisions of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) that mandate the use of asphalt pavement containing recycled tire rubber. We are working hard to fulfill the requirements of the ISTEA regarding recycled paving materials, while attempting to ensure that their use meets all proper worker health, environmental, and pavement performance standards.

Background

There are two main processes for adding recycled tire rubber (also known as "crumb rubber" material, or CRM) to asphalt paving mixtures. The first, known as the "wet process," involves blending CRM into asphalt cement before the binder material is mixed with the aggregate. The other method, known as the "dry process," adds CRM to the mixture as a substitute for some of the aggregate material. Both of these processes can be traced back to the 1960s, the wet process having been developed in Phoenix, Arizona, and the dry process in Sweden. At least ten variations of these two methods are in use today.

The FHWA has administered various technology transfer programs involving the use of CRM since the early 1970s. Many States have used these programs to design and build experimental projects, with varying degrees of success. Many States are currently evaluating projects using rubber-modified asphalt and rubber-modified hot mix asphalt mixtures. For our part, in addition to the demonstration programs, we cosponsored three national seminars on CRM in the 1980s and continue to provide technical support to the States and industry on the use of CRM technology. We have also issued publications on CRM, including "State of the Practice: Design and Construction of Asphalt Paving Materials with Crumb Rubber Modifier" (May 1992), and "Crumb Rubber Modifier Workshop Notes" (January 1993).

The ISTEA Requirements

Section 1038(b) requires the Department of Transportation (DOT) and the Environmental Protection Agency (EPA) to conduct a study to determine: 1) the threat to human health and the environment associated with the production and use of asphalt pavement containing recycled rubber; 2) the degree to which asphalt pavement containing recycled rubber can be recycled; and 3) the performance of asphalt pavement containing recycled rubber under various climate and use conditions. The DOT is to conduct that part of the study relating to the performance of rubber-modified asphalt pavement, and work with the EPA to determine the potential for recycling the pavement. The EPA is to conduct that part of the study concerning the health and environmental effects of the pavement. The study is also to examine the use of other waste materials in pavement.

Under § 1038(d) of the ISTEA, States must begin using CRM in asphalt paving materials in 1994. The amount of CRM each State must use is based on a percentage of the total tons of asphalt laid in each State under the Federal-aid highway program; on January 1, 1995, each State must certify that five percent of the total asphalt tonnage laid under the

Federal-aid highway program contains CRM, and that amount increases each year until it reaches 20 percent in 1997 and thereafter. The Secretary of Transportation may waive the minimum utilization requirement for any three-year period on a determination, made with the concurrence of the Administrator of the EPA, that reliable evidence exists indicating substantial health, environmental, recycling, or performance concerns associated with the use of rubber-modified asphalt. Section 1038(d) also contains provisions allowing the use of other recycled materials, as well as provisions mandating penalties for a State's failure to use the required amounts of CRM, waivers for individual States by the DOT under certain enumerated circumstances, and for reductions of a State's quota upon a joint determination by the DOT and the EPA that a State does not have enough tires available for use to meet the required minimum percentage.

FHWA Implementation Efforts

The FHWA and the EPA have formed a Study Coordination Group to develop, execute, and manage the research necessary to undertake the study required by § 1038(b). The initial phase of the study is nearing completion and we are working with the EPA to develop a synthesis of all available information for the study. We plan to continue evaluating long-term performance and recycling of rubber-modified asphalt. We expect to complete the study by the June 18, 1993, deadline. To date, the EPA has found no firm scientific evidence to suggest that the use of rubber-modified asphalt presents greater environmental or health risks than regular asphalt paving material.

In order to assist the States and industry in implementing this legislation, we held seven workshops in February and March in various locations across the country. A total of more than 1,400 agency and industry representatives attended the two-day meetings. The workshops provided a technical understanding of the design and construction practices of

CRM technology for State highway agencies and the paving industry. The workshops were well received by both agency and industry participants.

In addition, to date the FHWA has responded to over 40 requests for presentations from the American Association of State Highway and Transportation Officials (AASHTO), State DOTs, and industry on § 1038 and CRM technology. These presentations provide technical support in preparation for the minimum utilization requirements beginning in 1994. We will continue to respond to State DOT and highway industry requests for technical assistance.

Along with the EPA, we are also developing a program for a national symposium on the use of waste materials in highway paving. This symposium should define the state-of-the-practice for highway reuse of products, applications, and ideas, and will help us to undertake the extended study required under § 1038(b) of the use of other recycled material in highway devices and appurtenances. The symposium is scheduled to take place October 19-22, 1993, in Denver, Colorado. To date, at least 50 papers have been submitted for presentation at the meeting.

Issues

There have been concerns expressed about the increased initial costs posed by conversion to rubber-modified asphalt. Preliminary indications are that the cost for CRM exceeds the current cost for standard asphalt mixes by 20 to 100 percent, depending on the type of process used.

Furthermore, with the exception of a handful of States, experience with asphalt pavements containing recycled rubber has been limited to a few experimental test sections, or less. Many States have expressed reluctance to use CRM widely without more experience with the technology. The FHWA, through our workshops, publications, and technical support, continues to address this issue.

The addition of CRM to asphalt will require modifications to paving contractors' equipment. Many suppliers of asphalt pavement are small businesses, and they are concerned about their ability to recoup the cost of this additional equipment and still remain competitive. The paving industry is also concerned that, as this additional technology is in the developmental stage, equipment bought this year may quickly become obsolete.

Finally, State agencies and paving contractors are concerned by the lack of long-term performance data. The early uses of CRM asphalt occurred primarily in the southwest United States and concentrated on asphalt surface treatments. The use of CRM in hot mix asphalt did not begin until the late 1970s. As a result, there is very little long-term performance data available for evaluating the cost-effectiveness of asphalt pavements containing crumb rubber.

Conclusion

The FHWA has made major efforts, through our workshops, publications, and technical support, to prepare the States and the asphalt paving industry for the advent of the ISTEA's rubber-modified asphalt requirements. We, along with the EPA, are working to find solutions to the concerns expressed by the States and industry as a result of beginning widespread CRM use in 1994.

We will continue to work with the EPA in order to complete the study required by § 1038 by the June 18, 1993, deadline.

Thank you again for this opportunity to appear before the Committee today. I will now be glad to answer any questions you may have.

WAIVER TO SECTION 1038 MANDATE

Mr. CARR. Mr. Carlson, I am not sure I understood what your testimony was with regard to the section 1038 waiver. It seemed to be going in one direction and then at the last minute I heard a deviation from where I thought it was headed.

Mr. CARLSON. Let me explain that. The way the legislation is written, unless there is an indication that there is a serious problem, we don't have any basis for issuing a waiver to the use of the product in 1994, when a 5-percent usage level is mandated.

Mr. CARR. In other words, based on what you know today, you wouldn't grant a waiver?

Mr. CARLSON. That is right.

Mr. CARR. I guess my question is, your testimony seems to be filled with the uncertainties of all this.

Mr. CARLSON. That is correct.

Mr. CARR. And you have due concern for the concerns of others, but you seem to immediately rule out any waivers.

Mr. CARLSON. The way the legislation is written, unless we find a definite degradation of performance or a health problem, or the inability to recycle, we are directed to implement it. And we have not found such.

Mr. CARR. What studies have you done on recycling?

Mr. CARLSON. There have only been two, as far as I know, projects in the whole country where asphalt containing rubber modifiers has been recycled. One of them was in 1990 and one of them was in 1992.

I will let EPA speak to the health aspects, but in the paving business, one year's field testing doesn't make a decision on performance reliability. So basically there is nothing there that happened——

Mr. CARR. So based on your study, you can't say that you have resolved the questions with regard to recycling.

Mr. CARLSON. No, sir.

Mr. CARR. Is that correct?

Mr. CARLSON. Yes.

Mr. CARR. And you haven't resolved the performance issues.

Mr. CARLSON. There are very few long-term performance studies that I know of. But the ones that have been done on what are pretty much small, experimental sections, have not indicated any severe problems. And a couple of States, California and Arizona, as has been testified here, feel quite comfortable with the use of the product.

Mr. CARR. Putting the EPA aside for a minute, which I don't do lightly, but the recycling issue and the performance issue from an FHWA standpoint, I am seeing conflict here. Maybe you can help me resolve it.

It seems to me you say you don't know enough about the recycling, you don't know enough about the performance, but the statute says that your not knowing enough is not enough to grant a waiver.

Mr. CARLSON. That is exactly correct. It is different than our normal process for——

Mr. CARR. So the waiver is set up so that unless you prove a negative——

Mr. CARLSON. Yes, sir.

Mr. CARR [continuing]. You can't grant a waiver?

Mr. CARLSON. Yes, sir.

Mr. CARR. Proving a negative is very hard.

Mr. CARLSON. Yes.

MIXED EXPERIENCE WITH USING OTHER INNOVATIVE MATERIALS

Mr. CARR. So the statute presents you with an impossible task. So the statute that talks about a waiver is really kind of meaningless.

Mr. CARLSON. Well, let me just put it this way. If we had found something that qualified under the provisions, we would have been willing to consider a waiver. But we did not.

But if you are asking, are we satisfied with the performance that we know exactly where we are on this product, listening to Mr. Kulash and others, I certainly agree with what they said. We do not.

And it is a case-by-case thing, that we would like to have the opportunity to do longer-term research on, so we would feel a little more confident in our answers. But the way this legislation was written, we are not going to be able to do that.

When FHWA tries to use innovative materials technology, usually we have a better handle on the research that has gone on before it. We have had very successful cases where, for example, in the fly ash area, there is definitely a cost savings and certainly in some cases an improvement of concrete where we use fly ash. So I consider that acceptable. That was not a mandate but that was something we certainly encouraged.

In this somewhat generally similar area, in the 1970s, about the same time this modifier was coming on, we developed partially in Southern States a process known as open-graded friction courses. And I was in Minnesota at the time and advised the Minnesota DOT that they should try this using Taconite tailings for the binder, which has very good friction resistance.

Minnesota DOT uses tungsten-tipped snowplow blades. They put this down, and the next spring the tungsten blades had taken most of it off. We found out subsequently that Taconite tailings contain asbestos, so it turned out we were not in good shape on either side of that issue.

So my reluctance to start off on a major change in technology is based somewhat on previous experience of having been burned with taking off before we were really sure where we wanted to go.

LIFE-CYCLE COSTS OF ASPHALT AND CONCRETE

Mr. CARR. Give me a primer on what this does in terms of the economics of asphalt versus the economics of cement.

Mr. CARLSON. I can't give you an exact cost comparison. Certainly we have been pushing life-cycle costing, and if we can concur in the things that Mr. Jacobson said about the increased durability and so forth, it would certainly have an impact.

About all I am prepared to talk about today would be the fact that the asphalt itself, I think, by everyone's figures, the cost of asphalt paving would go up if we use substantial amounts of crumb rubber asphalt. We figure there would be a 20 to 100 percent increase in the cost of the material.

If it turned out that there was that much of a savings in thicknesses, then that would offset some of that cost increase. But it is pretty hard to do so with a 100 percent increase in cost, assuming that the thickness is going to offset that kind of increase.

Mr. CARR. Give me an education. What is a yard of a typical concrete cost and what is a yard of asphalt cost? Anybody know what is the comparison?

Mr. JACOBSON. Mr. Chairman, this particular study that was done by TTI, commissioned by the FHWA Department of Transportation, has some cost comparisons that are fairly accurate even in today's market.

In this particular case, it shows that the asphalt rubber concrete laid down was 48 percent more expensive than the conventional asphalt paving.

Mr. CARR. Right now I am talking not about rubber modified asphalt and regular asphalt. I am talking about regular asphalt and concrete.

Mr. CARLSON. It is difficult to answer that without having the entire project including the grading, but let me give you some rough numbers.

We can get concrete paving for something in the neighborhood of $20 a yard, and right now using an adequate base and having somewhat similar or attempting to get somewhat similar performance characteristics, asphalt pavement probably runs about that or a little less.

Mr. CARR. Do States have a system where they put out so much that has to be concrete and so much that has to be asphalt?

I go to these meetings. I have the asphalt guys sitting on one side of the room and the concrete guys sitting on the other side of the room, and throwing spitballs at one another. It is not that bad, but the fact is that there are competing pavements, absent the rubber modified asphalt.

And States, it appears to me, have an interest in trying to keep the lowest price per mile. That is number one. But States also seem to want to have the sometimes conflicting goal of keeping a bunch of concrete guys going and a bunch of asphalt guys going. They don't want either one to completely take over the State market. So they go by price, but then they also want to make sure that each side has enough business.

Now, how does that work? Can you tell me about that?

Mr. CARLSON. When I was a division administrator in Minnesota, I used to deal with both industries regularly, and as long as they both thought they were being properly cheated by us and the State highway agency, I felt fairly comfortable. That may not be the right answer, but it is kind of where you come from. It is a very tricky issue.

There are parts of States where one will be better and provide better life-cycle costs in the same State. The only thing we require is that an analysis be made, and based on the traffic and based on the material's availability, and based on the atmospheric factors, we attempt to work with the States in developing the lowest cost pavement.

Obviously, some States—one State, for example, I think, has a cement plant—may have a slight bias towards cement if they own the product. There might be another reason—there are all kinds of ramifications that get into this, including politics on the part of the State level.

So there are a lot of issues that come up in that, and in all honesty it is a thicket that FHWA tries to stay somewhat out of.

Mr. CARR. Well, your testimony indicates that a mile of conventional asphalt and a comparable mile of concrete would come out about the same.

Mr. CARLSON. That is a generalization.

Another example of a problem is that the cost of concrete in some parts of the country can run three or four times as high as the cost of concrete in other parts of the country because of labor costs and materials transportation costs and a lot of factors. It came up with our bridge cost studies. I think we have dealt with that in other appropriations hearings.

STATE DECISIONS ON USE OF CONCRETE VS ASPHALT

Mr. CARR. Part of the problem of trying to understand this legislation and still get the best possible pavement for the lowest possible cost is this subtle interplay between concrete and asphalt and the road decisions of many States. And what this section seems to do, well intended though it might be, it jumps into the middle of that difficult equation in a less than even-handed way.

It doesn't say, for example, that 5 percent or let's say 2.5 percent, say the States divided out pretty equally over time, not in any one year perhaps, but over a long period of time, that concrete pavers and asphalt pavers get about a 50/50 shot at all the work. The statute doesn't say that 2.5 percent of the asphalt has to contain rubber and 2.5 percent of the concrete has to contain rubber. It is a mandate that is only on one half of the equation that States have to meet.

If it increases—you can go at this, I suppose, two ways. If it increases the price of asphalt by 50 to 100 percent, then those folks will not get too many bids unless the State then modifies their requirements including life-cycle costs, which according to Mr. Baker and Mr. Jacobson will prove out that they will be able to recover some of it in thickness and some of it in longer life.

As an investor of public money, that would be an appealing equation which might actually tip the whole process in favor of asphalt to the exclusion of concrete, with one exception. If I am a person like Mr. Welke, we are talking not about how many dollars we save 30 years from now, but how many dollars we have to spend today. That is a tough equation.

Mr. Jacobson.

ADVANTAGES OF ASPHALT RUBBER

Mr. JACOBSON. Mr. Chairman, some of the best uses of asphalt rubber are in alternate construction procedures and one of the reasons it is being used quite widely is because the alternate construction procedures are more expensive than the asphalt rubber.

One of the prime examples of that is in the rehabilitation of Portland Cement Concrete pavement. The cost of going and grind and groove and reseal PCC is in the neighborhood of $9 to $11 a square yard, plus it takes a great deal of time, four to six months you are out on a stretch of freeway.

It has been proved that thin layers of asphalt rubber can cover the same area in a matter of days and will last longer and reduce the noise level. In Europe, the development of asphalto silencioso and the Flooster asphalt was a thin layer over Portland Cement Concrete pavements that were brand-new in order to eliminate noise levels so they wouldn't have to put up expensive wall barriers in some of the areas there.

LONG-TERM RAMIFICATIONS OF PAVEMENT DECISIONS

Mr. CARR. That gets more to the virtues of rubber asphalt. I am trying to understand the complex relationship in terms of pavement pricing and pavement. The State legislatures and the governors of all the States are putting a lot of pressure on the people represented by Mr. Francois here to try to improve more with less money and get durability and longer life.

I get so many people pleading with me to spend an extra amount of money on something in this Committee because 30 years from now it will pay off and that is an appealing argument.

I am not sure that the taxpayers of 30 years from now are going to wake up one morning and thank Bob Carr for doing that. I am going to be in the grave and nobody is going to know I ever existed. Maybe you don't do that for recognition, but because it is good for the country.

We often get trapped here and I am sure that the State has a difficult time of trying to parcel out scarcity, not parcel out dollars. So we end up rationing things.

I don't know that the country hasn't decided so far as I can see on a 40-year standard at 120,000 pounds. It has been recommended, is being considered. We haven't decided to do that yet.

Mr. CARLSON. Some roads are carrying those kinds of loads now by legislation.

SINGLING OUT RUBBER ASPHALT

Mr. CARR. We are getting there but we haven't made that decision yet. This provision that we are all struggling to accommodate to, it is the law of the land. You have concrete, you have asphalt, rubber asphalt, it is a very complex area.

And yet the difficulty I am having with this statute is not rubber and asphalt. It is the mandate. That is the difficulty here. Sort of taking out one thing and saying this is a priority above all else and not really considering that all else is complicated. It isn't just a matter of people having a visceral hatred for rubber.

Dr. Epps, have you any opinions about this?

FIRST PAVEMENT COSTS VS REHABILITATION COSTS

Mr. EPPS. Maybe some point of clarification, typical things. The first cost of putting in a new pavement at a new particular location of hot-mix asphalt sections versus Portland Cement Concrete sections, the latter would be 5 to 20 percent from a first cost point of view. From a life-cycle point of view, depending upon the cost-specific conditions, the cost may come out nearly equal or in favor of one or the other.

Many applications of the crumb rubber modified asphalt materials are not for new pavements. Most are used for rehabilitation and maintenance of existing pavements. We are talking about first costs associated with rehabilitation alternatives to our pavements. Those costs, depending upon a number of parameters, could be 50 to 100 percent more where the crumb rubber modified asphalt materials are used.

However, where you have good performance, like Arizona and California have in some cases, you overcome that by reducing the thickness of more costly materials as compared to conventional materials to overcome partially the first cost, and then you say performance based on our experience will be longer for the new materials as compared to conventional materials.

The California experience, they have had very good experience on some of their test pavements on projects where they have pavements with a high amount of deflection when loads go over them, and the asphalt rubber materials are able to tolerate this much better than conventional materials.

So in a site-specific condition, it makes very good sense to use new high-tech materials to satisfy those needs. In other conditions, it makes no sense to use these materials. It is a question—

SITE-SPECIFIC CONDITIONS FOR RUBBER ASPHALT USE

Mr. CARR. But the conferees, in their infinite wisdom, said that there are at least 5 percent site-specific good uses for 1994 and they said around the country, maybe in the State of Rhode Island, there is 20 percent by 1997.

You don't know that, do you?

Mr. EPPS. I think based on the entire piece of literature that I have studied, and I am not picking particular items of literature, for every good one we can find bad ones. But for site-specific conditions, that material as well as a lot of other materials is a good cost-effective solution. In other cases, it is not.

I don't think we are ready to say today that we can find 5 percent of our paving projects where this is a good economical solution today with our existing technology.

APPLYING RUBBER ASPHALT LAYERS

Mr. CARR. Let me ask you another one, having to do with my rather embryonic analogy about paving. I have learned so much today from all sides.

But there is a process that is being used by Mr. Thompson's company and I am sure is being used by many others around the country where you end up going over a concrete and rubblizing it with a high-powered machine. And then, as I understand, the rubble is wetted down and rolled and wetted again and rolled. Then they put a fairly thick layer of asphalt on top of that.

Is everybody with me? I don't know what that all means. I mean, one idea is that you take the rubberized asphalt and put a thin layer, on top of concrete. Could you thin the layer that has to go into where you are reconstructing the highway by rubblizing the concrete? Does that work?

Mr. JACOBSON. That was exactly the performance done on this project Doug Forstie talked about. They did a crack and seat project and were able to use the asphalt rubber over that and it out-performed the conventional-they have side-by-side comparisons put down at the same time and the asphalt rubber was three or four times better.

Crack and seat is where they break up slabs and seat them and roll them and put them in.

Mr. CARLSON. There are two techniques. One is crack and seat and the other is rubblized concrete. They are not the same. Based on the idea that you are going to stop reflective cracking, if you don't break the concrete up into rubble, in other words, down to small sizes, then these blocks of concrete would tend to be able to move independently.

If you have a product that is possibly able to heal over the cracks better, that would seem to me to be a better product than something without that kind of a capability.

Mr. CARR. Then there is the question of thickness, is it possible that you could reduce the thickness on rubblized concrete and make some savings?

Mr. CARLSON. Rubblized I don't think would make that much difference, because if you really rubblize it, you are not going to get reflective cracks through small chunks of concrete. If I understand the technology, it would not make that much difference on thickness.

We have had some fairly spectacular failures in the crack and seat area and some successes. You need to be able to look at different ways of doing business and to do research on it. That is what we have been doing on those kinds of pavements. They weren't the subject of today that I knew of, so I haven't gotten familiar with them.

MANDATED USE OF RUBBER ASPHALT AND EFFECT ON USE OF OTHER TECHNOLOGIES

Mr. CARR. It is just by way of educating me. I have learned a lot today.

Bottom line, Mr. Carlson, would you have, if you had your druthers, would you think the idea of a 5 percent or any percent mandate per year is good public policy?

Mr. CARLSON. We would prefer not to see mandates of that nature in our legislation because it goes contrary to our normal way of developing innovative technology.

Mr. CARR. Could it possibly be in line with what Mr. Price was getting at with our first panel, that this mandate could in fact, maybe inadvertently, retard the development of other technologies?

Mr. CARLSON. Obviously this legislation has focused a lot of attention on rubber as a modifier. To the extent that that takes out consideration of other similar techniques that are similar, I think that would be true.

For example, in the United States since the trip to Europe Mr. Jacobson talked about, I think five or six States now have built stone matrix projects, and we are watching them.

We also have the ability to look into this. We have pavement accelerated testing facilities that can give us answers more quickly that we can be more comfortable with, which I think will be used in some of the stone matrix projects and also in crumb rubber projects as we move forward with that.

Mr. JACOBSON. Mr. Chairman, the method of developing innovative technology in our system is to curtail it. That is one of the reasons this legislation comes about.

I have been working with this program for a long time, with FHWA, and every place you turn you hit a roadblock. They don't want to listen to an engineer that knows how to design the right pavement to make it work. Every engineer out there wants to go out and reinvent the wheel.

When they went out with the research projects on asphalt rubber, they didn't go to anyone that knew what they were doing. They went to an institution that was in someone's pocket to get them to do the research on it.

There are a lot of research people out there that have been involved in this that know about the product, that know how to do it right.

CONSEQUENCES OF MANDATING RUBBER ASPHALT

Mr. CARR. Dr. Epps doesn't strike me as someone in somebody's pocket and he seems eminently fair and balanced about it, and Mr. Kulash as well.

It is one thing to demand fairness for something that you are wanting to promote. It is another thing to demand by legislation that everybody adopt your idea.

That is one of the problems we are struggling with this thing now. The problem isn't giving an open door to rubber. The problem is this D(1) sub (a), (b), (c), and (d) that says, Thou shall use this by certain percentages. And Mr. Baker is absolutely right. People don't like to be told what to do.

But it is not just that. It is that people don't like to be told what to do against their better judgment and they have judgments and ideas and points of view. This statute apparently says that doesn't matter. We are going to make the decision as the Congress of the United States, and I know how fallible this institution is.

That is the real problem here. It isn't about trying to squelch rubber. None of us like the piles and piles of old tires. Something needs to be done about that. No one more than this Committee, because we are the ones that spend the dollars. The other committee dealing with transportation, they authorize programs. They authorize programs like this and they are not the ones that are responsible for coming up with the real tough decisions on how to spend the taxpayers' money and get the best bang for the buck for it.

I think in all candor I have learned a lot about the technology today and I have benefitted by your testimony, and Mr. Baker was an exciting witness, too. In terms of excitement, you won the day. I learned a lot. I am glad we had this hearing. I am glad you are here.

EFFECT OF MANDATES ON PERFORMANCE BASED DECISIONS

But on the other hand, these percentage mandates cause this Member a real serious problem because we are trying as a government and as a Congress, and this Committee to get us toward performance basing. That is why we have our investment criteria.

I will be glad to give any of you a copy of this criteria. Take one on your way out. We are going to be evaluating projects in this country based on investment quality criteria. We get down to this criteria and say, Woops, somebody said 5 percent of it has to be thrown here where we don't think it is cost effective. Maybe in other areas we want to give it a bonus because in some areas it may hit a home run.

The Congress of the United States doesn't know enough to tell every State in the Nation, whether you are Rhode Island or Delaware. There are fewer people in the State of Delaware than there are in my whole congressional district. That is an historical accident, but that is fine. That is like telling one of my counties, 5 percent of your roads in three counties of Michigan have to do 5 percent, but California, with all their miles of highways, 5 percent to them doesn't mean a thing. They can easily accommodate that, I am sure.

TRANSPORTATION RESEARCH BOARD WORK

So this piece of legislation I think is really fundamentally flawed. Is the TRB doing any work in this area to anybody's knowledge?

Mr. EPPS. The synthesis that I reported on is the Transportation Research Board activity through the National Cooperative Higher Research Program, and they have another activity that is just getting started.

Mr. CARR. Let me——

Mr. MORGAN. TRB has not done any original research.

Mr. EPPS. Synthesis is not original research. It is just a restatement of the existing literature.

Mr. CARR. I have learned a lot. It has been a good hearing and I really appreciate the vigorous give and take here today.

The only thing is, we are just trying to do the best thing not only for the country, not only for future technology and for future opportunities; we have to do something for the taxpayers here. And trying to find out what is the best for the taxpayers is not always easy to do, but that is the ultimate goal of this Committee.

Thank you for coming and paying attention to that.

We will have a number of questions that we will ask for the record.

QUESTIONS FOR MR. DEAN CARLSON

CRUMB RUBBER ASPHALT HEALTH RISKS

Mr. CARR. Mr. Carlson, the Environmental Protection Agency, with which you are conducting a joint study to determine the appropriateness of using crumb rubber technology in a widespread manner, has preliminarily concluded that there is no firm scientific evidence to suggest crumb rubber asphalt presents greater environmental or health risks than using conventional asphalt paving material. Has the Federal Highway Administration similarly reached any tentative conclusions concerning the use of rubber modified asphalt you could share with us today? Given that the date of your joint report is only a month away, you must be very close to completion, are you not?

[The information follows:]

FHWA and EPA are finalizing the report due June 18. Based on the studies to date and limited project data available, there is no reliable evidence that asphalt pavements containing recycled rubber cannot be recycled to substantially the same degree as conventional pavements, or that asphalt pavements containing recycled rubber do not perform adequately as materials for the construction or surfacing of highways and roads.

CRUMB RUBBER ASPHALT RESEARCH

Mr. Carr. What research has FHWA conducted and funded in recent years on the crumb rubber issue?

[The information follows:]

FHWA has supported the use of scrap tire rubber in several activities over the years. Demonstration Project No. 37 "The Use of Discarded Tires in Highway Construction," in 1976 and Test and Evaluation Project No. 3 "Asphalt Additives" are two programs that have been available to the States. In 1986, the FHWA initiated a pooled-fund study entitled, "Investigation of Materials and Structural Properties of Asphalt-Rubber Paving Materials." These projects mainly examined the use of a wide variety of wet and dry asphalt rubber paving applications, however, most States did not develop long-term performance research programs and experience.

During the past 2 years, there has been an influx of research and experimental construction in response to section 1038. A synthesis of practice was conducted under the National Cooperative Highway Research Program on the engineering aspects of asphalt pavements containing recycled tires (NCHRP 20-5, Topic 2202.) The FHWA and EPA recently completed a study as outlined in section 1038 of ISTEA. FHWA is initiating a pooled-fund research project in which 33 States will participate to conduct long-term performance and economic evaluations of asphalt pavements containing recycled tires. Under the provisions of section 6016 ISTEA, we have also initiated research in the fundamental properties of asphalt cement modified with CRM. Other research has been accomplished at the State level using State apportioned Federal-aid research funds and other State funds.

Mr. Carr. What level of effort is being conducted in 1993 and what is planned for 1994?

[The information follows:]

In 1993, $455,000 in research related to CRM technology is funded. The FHWA and EPA are funding $365,000 towards the ISTEA Section 1038 joint study of CRM. This includes $265,000 from FHWA and $100,000 from EPA. FHWA is funding an additional $90,000 for research on the fundamental properties of asphalt containing CRM.

The $90,000 study is part of a larger contract with the Western Research Institute (WRI) to study the fundamental properties of asphalts and modified asphalts under section 6016 of ISTEA. The study with the WRI was initiated to examine the fundamental chemical interactions between asphalt cement and crumb rubber modifier and is programmed at $90,000 per year over the next 5 years.

The FHWA has initiated a $2–5 million study to start in FY 1994 to examine the unresolved performance and recycling issues identified in the ISTEA section 1038 study. Approximately 33 State highway agencies have contributed over $1 million. The current funding level will allow FHWA to develop a database of pavement performance for a 5-year period.

Finally, to supplement this effort and to obtain early performance data, FHWA will initiate a program of accelerated pavement testing. This effort is anticipated to cost approximately $1 million. The study is planned to commence in FY 1995 and is anticipated to last for 1.5 years.

FHWA'S POSITION ON USE OF CRUMB RUBBER ASPHALT

Mr. CARR. Does the Federal Highway Administration have a position on rubber modified asphalt, or do you just wish the entire issue would go away?

[The information follows:]

FHWA has recognized the technology of using crumb rubber as an asphalt modifier since the early 1970's. Through our Technology Transfer Program, we assisted many States to design and build experimental projects. Our main concern is with the mandated implementation in 1994. Today, only a very few States and contractors have experience in applying this technology on more than a limited, experimental basis.

To help the States and contractors learn about CRM material, we developed and presented seven 2-day workshops in Atlanta, Albany, Chicago, Denver, Dallas, Reno, and Spokane in February and March of this year. Over 1400 from the States and asphalt paving industry attended. We have encouraged the States to construct trial projects in 1993 to gain "hands-on" experience before the minimum utilization requirements become effective.

CRUMB RUBBER ASPHALT RESEARCH

Mr. CARR. The FHWA document entitled "State-of-the-Practice—Design and Construction of Asphalt Paving Materials with Crumb Rubber Modifier" recommends that additional research needs to be done on the issue, especially concerning recycling. Can you elaborate a little for us here. Exactly what do you think needs to be done, who should do it, how long will it take and how much will it cost?

[The information follows:]

To date, only two projects using recycled pavement containing recycled tires in the Hot Mix Asphalt have been documented. These two projects represent only a limited sampling of the conditions and experience needed to implement this technology with confidence across the country. There is very limited long-term engineering or economic performance data available on recycling asphalt containing CRM.

Several issues must be resolved to facilitate effective nationwide use. This includes the development and validation of suitable pavement design procedures and construction practices for various applications of virgin and recycled materials containing CRM.

A nationally coordinated effort is necessary to address the engineering variables involved and to minimize duplication of research efforts among the owner agencies. The FHWA will initiate a contract to address these issues. It is anticipated that the contract could cost as much as $5 million and be 3 to 5 years in length.

Mr. CARR. Is there any plan of FHWA to conduct or fund such research?

[The information follows:]

The FHWA has programmed $2–5 million over the next 5 years.

EXTENT OF USE OF CRUMB RUBBER ASPHALT

Mr. CARR. How many miles of roads are there currently in the nation paved with crumb rubber modified asphalt?

[The information follows:]

The mileage is unknown at this time. Less than 1% of pavements are constructed with modified materials. Arizona DOT, in their 1989 summary report, identified approximately 700 miles of wet process CRM material used as a surface or inner-layer. The other State reporting significant use of CRM materials in asphalt pavements is California. In 1991, CalTrans reported on 21 projects, approximately 100 miles, constructed since 1978. Again, primarily using the wet process.

DESIGN AND CONSTRUCTION STANDARDS

Mr. CARR. What about the development of standards? The report also cites the need for additional work in this area. What specifically is the FHWA doing to address this issue?

[The information follows:]

FHWA will continue to identify and develop design and construction guidelines to assist the owner agencies and the contracting community to effectively construct pavements containing CRM.

CRUMB RUBBER ASPHALT HEALTH RISKS

Mr. CARR. The EPA witness stated that, "as a preliminary matter, we see no trends of significantly increased or decreased emissions attributable to the use of recycled rubber in the asphalt." Do you think sufficient research has been done either on conventional asphalt or on crumb rubber modified asphalt to make definitive pronouncements on the environmental and worker health issues posed?

[The information follows:]

Under ISTEA Section 1038, EPA has primary responsibility for evaluating the potential increase in the threat to human health and the environment. We have no evidence to show that the risk to the environment or the worker health would be different than the preliminary conclusions stated by EPA.

QUESTIONS FOR MR. CARL JACOBSON

Mr. CARR. Mr. Jacobson, you claim that crumb rubber modified asphalt will extend the life of roads by as much as five times. On what do you base this claim? Has any rigorous research been performed to support you claim?

[The information follows:]

There have been over 150 reports and papers relating to asphalt rubber that show that it extends the life of pavement. In the City of Phoenix alone, the 20-Year Asphalt Rubber Report shows surfaces that have been used for over 21 years with no maintenance. Normal conventional pavement requires maintenance every 3 to 5 years. In a TRB Report from California, the Ravendale Study showed that asphalt rubber of 1-½" thickness had outlasted 4" of conventional pavement and was still performing, even though the conventional pavement had to be replaced. The FAA Report, which I quoted from at the hearing showed that asphalt rubber would last as much as 17 times longer than conventional pavement.

Mr. CARR. Mr. Jacobson, you also claim in your statement (page 5) that "there are less emissions from asphalt rubber than from conventional asphalt paving." Do you have any scientifically conducted, documented research to demonstrate the validity of this claim?

[The information follows:]

The nature of rubber mixed with asphalt is that rubber absorbs many of the light ends that are present in asphalt. These light ends are the emissions that would go into the air when asphalt is heated. When asphalt rubber is heated, these light ends are locked in and do not emit. A copy of the Asphalt Rubber Emission Study was included in the literature given to the Congressmen during the hearings.

Mr. CARR. Are you aware of or did you participate in any efforts to try to get the patents for asphalt rubber extended through Congressional action?

[The information follows:]

Yes, I am aware of the efforts to try to get the patents for asphalt rubber extended through Congressional action, and did not participate in that action.

QUESTIONS FOR MR. DAMIAN KULASH

Mr. CARR. Mr. Kulash, you have added an excellent perspective to the testimony presented today. You state that asphalt, any asphalt, can vary greatly from any other batch. This could depend on the underlying material used, its source, and the temperatures used in processing, among other factors. Do you know if there has been any attempt to account for such differences in the studies done to date on crumb rubber asphalt?

[The information follows:]

Yes, there have been studies done that show similar differences in crumb rubber asphalt. These studies show variations in the crumb rubber itself, in crumb-rubber modified asphalt binders, and in asphalt mixtures using crumb rubber modified asphalt binders. I will respond by citing a few works in each of these three contributions.

(1) The properties and behavioral characteristics of crumb rubber vary substantially depending on the tire type and the process used to prepare it. Some reports that discuss this are: S. Shuler, Specification Requirements for Asphalt-Rubber, Transportation Research Record 843, 1982, P. 1; M.A. Heitzman, State of the Practice—Design and Construction of Asphalt Paving Materials with Crumb Rubber Modifer, Federal Highway Administration, Report FHWA-SA-92-022, May 1992; ———, Ruber used in Asphalt-Rubber Applications, Proceedings of National Seminar on Asphalt-Rubber, October 1981.

(2) The chemical and physical properties of asphalt-rubber binders commonly related to performance show wide variability, depending on both the asphalt and rubber source. See, for example: M. Stroup-Gardiner, D.E. Newcomb and B. Tanquist, Asphalt-Rubber Interactions, Paper prepared for presentation at the 72nd Annual Meeting of the Transportation Research Board, January 1993. ———; Road Binders and Energy Savings, Organization for Economic Co-operation and Development, Road Transport Research Report, 1984, p. 79. ———; The Chemical and Physical Properties of Asphalt-Rubber Mixtures, Arizona Department of Transportation, Report ADOT-RS-14(162), July 1977. ———; Viscosity Measurements of Asphalt-Rubber Binders, Proceedings of the National Seminar on Asphalt Rubber, October 1989.

(3) This variability in asphalt-rubber binder properties is reflected in performance differences among asphalt-rubber paving mixes: ———, Investigation of Materials and Structural Properties of Asphalt-Rubber Paving Mixes, Federal Highway Administration, Volume I of Report FHWA/RD-86/027, September 1986; ———, Investigation and Evaluation of Ground Tire Rubber in Hot Mix Asphalt, National Center for Asphalt Technology Report, August 1989.

Mr. CARR. Could such differences account for some of the very great range of opinion and experience we seem to be seeing on crumb rubber?

[The information follows:]

Yes, variations in the chemical and physical properties of crumb rubber modified asphalt binders could be one of the key causes of the divergent opinion and experience seen on this subject. Other features, such as the process used to incorporate the rubber into the asphalt also appear to influence the divergence of experiences, as do differences in climate and other site factors.

Mr. CARR. Please elaborate on the following comment you make on page 5 of your statement: "The effect of an across the board requirement such as this is to force all states to use crumb rubber to the same statutory percentage, even though some states may have combinations of asphalt binder, climates, and traffic loads that are not amenable to asphalt mixes constructed using crumb rubber."

[The information follows:]

An asphalt pavement is essentially a mixture of asphalt binder, sand, course aggregate, and filler. The performance of the constructed pavement is influenced by properties of each of these components. For example, to make a pavement that is more resistant to rutting, an engineer might: Select an aggregate that has been crushed and has many angular faces, rather than a gravel that has weathered naturally and has many rounded surfaces. (This creates an aggregate structure with better interlocking support and less of a tendency for the component stones to slip around and allow ruts to form.); Use a "manufactured sand," rather than a natural sand, for the same reason as above; select an asphalt binder that does not lose too much stiffness when it gets hot; reduce the amount of extremely fine dust that is allowed into the mix; and add a modifier, such as various polymeric materials or crumb rubber, to the asphalt binder to help it retain its stiffness when it gets hot.

Each of these design changes could help produce a rut-resistant asphalt pavement. Each also adds to a pavement's cost. Getting good performance at a reasonable cost requires an engineer to select components that are locally available and which meet the site's demands.

Using a performance-based design approach, an engineer could consider different combinations of these steps. The degree of increased performance that is desired depends upon the climate at the site, the expected traffic levels that the pavement will carry, and the structural properties of the foundation and supporting pavement layers. The specific steps that an engineer selects to produce the desired rutting resistance depends upon the availability and prices of different materials in that region, and the extent to which each contributed to reduced rutting.

There are dozens of individual design changes that an engineer could select to improve the performance of a pavement. These include imposing more stringent specifications on many features of component materials and addition of additional special materials. A performance-based approach allows an engineer to select the most cost-effective combination, given the site needs and the local market conditions.

A mandate to adopt any specific feature or component replaces a design process that achieves desired performance at the lowest possible cost with one that includes a certain component or feature regardless of its performance or cost. Mandates thus force the use of an approach with higher cost or lower performance than would have been the case if the design were passed solely on achieving desired performance at the lowest cost.

Mr. CARR. You also state that making a major shift in asphalt technology takes from five to ten years. Where would you say we are in the crumb rubber issue?

[The information follows:]

A major shift in asphalt technology takes five to ten years because new specifications and tests need to be developed; new laboratory test equipment or field quality control equipment may be needed, new mixing plant and paving equipment may be needed, and thousands of agency and contractor personnel need to be retrained. Although some states have already taken actions like these to facilitate the use of crumb rubber asphalt, most states have not. I would estimate that 80 to 90 percent of public agencies are at the very beginning of this process as regards crumb rubber, and that 10 to 20 percent are further along.

It is not necessary or desirable to go through a technological conversion like this for any single specialized component. The availability and cost of asphalt modifiers will change in future years, and public agencies and their contractors will need to use a broad range of materials with confidence. The performance-based tests that SHRP has developed and which are being phased in during the next five or so years will provide this know-how, and in the process it will improve the ability of states to use crumb rubber (or any other material) effectively. That is, the performance-enhancing properties of crumb rubber *are* measured by SHRP's test methods, and as engineers use these new test methods, they will be better able to apply crumb rubber and other asphalt modifiers in designs where they can be useful.

Mr. CARR. To what extent did the Strategic Highway Research Program look at crumb rubber modified asphalt during the conduct of its recent five year effort? Why did it not receive a greater priority in your opinion?

[The information follows:]

Two asphalt-rubber binders were extensively evaluated by one of our contractors in order to measure their performance-related rheological properties. These binders were produced by blending a single commercial crumb rubber modifier with two of our reference asphalts of widely varying chemical composition and performance.

The following testing was conducted on these binders: High temperature rheology with the dynamic shear rheometer; low temperature tensile properties with the direct tension test device; and low temperature creep stiffness behavior with the bending beam rheometer.

These explanations were important in showing that crumb rubber can affect the performance of asphalt binders, and that our tests are able to detect these performance differences. They have not been extensive enough to permit us to explore the entire range of asphalt binders and mix designs to see where crumb rubber can most effectively be employed.

Overall, SHRP research was based on more than 30 reference asphalt binders, and only two of these were also tested after being modified with crumb rubber. We did not test a broader range of crumb-rubber-modified binders in our research approach because our objective was to develop good yardsticks for measuring the performance of all modifiers, rather than extensive try-it-and-see experiences with specific materials. By adopting good yardsticks of performance, we will be able to assess the promise of many performance-enhancing components and designs. As new materials or designs become available, we will not need to go through an extensive technological conversion each time. We will have the tools we need to deal with crumb rubber or thousands of other specific ingredients or designs, quickly and efficiently.

Our research did not emphasize crumb rubber versus any other specific material. Rather, it was a question of improving our overall technological capability so we would assess any and all performance-enhancing materials or designs. The future will undoubtedly produce promising new materials, and our ability to exploit them effectively depends upon having sound performance-based specifications and tests such as we have been developing through SHRP research.

Mr. CARR. Mr. Kulash, do you think adequate work has been done in the establishment of protocols and standards for the crumb rubber industry?

[The information follows:]

No. I believe that the diversity of results that have been obtained using this material probably stems in part from the variability of the rubber and how it is introduced into the binder. Before embarking on extensive use of this material, it is important to have a better set of protocols and standards related to it. To the maximum extent feasible, these protocols and standards should relate to the performance of the material, both within the asphalt binder and the final asphalt mixture.

Mr. CARR. Who owns the patents on the Superpave technology? To what extent has it been used operationally?

[The information follows:]

Superpave technology is not dependent upon any single patented device. The Superpave system itself—its tests, specifications, and design methods—are not patented. Some of the devices that can be used to perform these tests may include specific patented features, but none of the Superpave tests requires dependence upon a single device or a single supplier because of such patents.

The name "Superpave" has been trademarked by the National Academy of Sciences to provide a distinguishing label for this technology and to prevent that label from being reserved for any single contractor's product. The public agencies and contractors that apply Superpave tests and specifications use this label without any payment to or permission from the holder of the trademark.

Superpave is just beginning to be used operationally, although that usage is expected to increase rapidly over the next several years. To date:

About 20 state highway agencies, more than 5 asphalt refiners, between 5 and 10 modifier producers and about 5 paving contractors are presently using and evaluating the Superpave binder test methods and equipment individually or through round-robin testing programs and user-producer groups.

Numerous additional organizations are in the process of acquiring Superpave Test Equipment.

The complete Superpave system was used in 1992 to design and build field test pavements in Wisconsin (I–43 and I–94), Indiana (I–65), and Maryland (I–70).

About 100 more test sections will be built in the summer of 1993, 1994, and 1995.

RESPONSES TO WRITTEN QUESTIONS

POSED BY MEMBERS OF THE

SUBCOMMITTEE ON TRANSPORTATION AND RELATED AGENCIES
OF THE HOUSE COMMITTEE ON APPROPRIATIONS

TO

FRANCIS B. FRANCOIS

Executive Director, American Association of State
Highway and Transportation Officials

RELATING TO

MAY 12, 1993 HEARING TESTIMONY

ON

SECTION 1038 OF THE
INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT
(PL 102-240)

MR. CARR:

Mr. Francois, Mr. Baker's statement claims that the AASHTO survey of asphalt rubber does not reflect the price decrease of 25 to 50 percent of the material during the past 12 to 18 months. Is his statement accurate? What price for rubber asphalt was assumed in the AASHTO survey?

[the information follows]

MR. FRANCOIS:

The cost of CRM HMA as presented in our January, 1993 survey represents an average of what states reported as either having paid in 1992 or what they expected to pay for these products in 1993. Twenty-two states reported an average price of CRM HMA using a non-patented process to be $40-44 per ton of mix representing an 50% increase over the average cost of conventional asphalt. Twenty-five states reported an average price of CRM HMA using a patented process to be $53-58 per ton of mix representing a 98% increase over the average price of conventional asphalt. We did not collect price information for the period before that stated above so we do not know if these prices are lower than those paid 12 to 18 months before.

In response to your second question, the AASHTO survey did not assume a price, it asked for price information.

MR. CARR:

Other representatives of the pavements industry have stated that the AASHTO survey does not consider life cycle costs in its comparisons with more traditional asphalt. How do you respond to these observations?"

[the information follows]

MR. FRANCOIS:

While our survey did not specifically request life cycle cost data many states included relevant information. Life cycle cost information is very difficult to determine for a pavement type which has had few long term field tests, on limited pavement applications, performed. Most of the CRM HMA pavements have not been in place long enough to fully evaluate these costs. The following information provided to us could be helpful in developing a sense of what the impacts of CRM HMA might be.

CONNECTICUT reported that they have placed 50 test sections of CRM HMA beginning in the early 1970's and have found no significant difference in performance between CRM HMA and conventional HMA. In this particular case the life cycle costs would be much higher for CRM HMA than for conventional HMA. A copy of a Connecticut report is attached.

ARIZONA reported that they have placed many CRM gap graded overlays and believe this has resulted in lowered maintenance cost but that it does not extend the pavement life. They further reported that they think the reduced maintenance cost might be enough to offset the additional cost of the CRM HMA.

CALIFORNIA has taken a different approach in trying to control costs. They reduce the overlay thickness requirements in their gap graded asphalt rubber mix to reduce the initial costs. California believes that by doing this they have found a method of bringing the cost of CRM HMA to about the same as or slightly higher than that of conventional asphalt for a specific application.

OKLAHOMA reported that out of four attempts to utilize CRM HMA pavements they have had no successes. In this case life cycle costs cannot be calculated.

VIRGINIA reported that they have found no performance difference between CRM HMA and conventional HMA. Again, this would indicate significantly higher life cycle costs for CRM HMA than for conventional mixes.

FLORIDA has constructed about 7 CRM HMA surface course sections over the last 4 to 5 years. From preliminary results they hope that these sections will increase the life of their surface courses from 5 to 8 years for conventional overlays to 7 to 10 years CRM HMA overlays. It is too early to determine if this extended life will result. If estimates are correct an increase in surface course life of 20 to 40% could result.

TEXAS reported that out of seven CRM HMA projects constructed over the last few years, four have shown premature distress of which two have failed completely.

NEW YORK studied two CRM HMA pavement sections for three years and found comparable performance to conventional pavements.

MONTANA placed two CRM HMA sections. One completely failed and the other is performing very well.

NEW JERSEY has constructed 4 CRM HMA pavements in the past two years, of which one completely failed. On another, New Jersey has observed that the crumb rubber is coming out of the pavement and is accumulating on the shoulder of the road.

RHODE ISLAND placed one section of CRM HMA pavement in 1987 and has found that it is performing comparably to the conventional asphalt control section placed at the same time.

The above comments from states show that performance results for CRM HMA are quite mixed. The states with the best performance believe they have found methods that perform well enough in their climatic region to offset any additional costs associated with CRM HMA. The states with the worst performance have experienced failures of about half of the CRM HMA pavements constructed which would indicate extraordinarily high life cycle costs of CRM HMA pavements. The states in the middle have experienced comparable performance of CRM HMA and conventional pavements. In these cases the life cycle costs would be increased by the additional amount paid for CRM HMA.

MR. CARR:

Your statement mentions the experience states have had with the application of rubber modified asphalt. Costs of twice that of more conventional asphalt were common. Did your survey distinguish between those states using a patented process and those using a process with no current patent? Do you have any estimate for the difference in price depending upon whether or not a patented process is used?

[the information follows]

MR. FRANCOIS:

Our survey requested cost information on both patented and non-patented processes. On the average states reported paying approximately a 50% premium for non-patented and a 98% premium for patented CRM HMA mixes. Price increases for the asphalt liquid binder were on the average 236% higher for the non-patented and 297% higher for the patented processes. Many states reported that they were experimenting with both types of processes.

MR. CARR:

Mr. Francois, one of the assumptions used in your survey was that costs in 1997 would remain constant except for a possible decrease in patent royalties. Does this mean you assumed no decline in price even though there might be large increase in demand if the ISTEA mandated amounts are not changed? Why do you think the price would be so inelastic? Does this assumption tend to skewer your results?

[the information follows]

MR. FRANCOIS:

Obviously trying to predict the future is a difficult task. Our survey represents more of a snap shot in time rather than providing the basis for a full economic analysis. The estimate for the total added costs of full implementation of ISTEA Section 1038, which is only 4 years away, was based upon today's cost with some allowance made for the reduction in the use of patented processes. This is believed to be reasonable since, while non-patented processes are available at significantly lower costs, 70% of the CRM HMA projects planned for this year will utilize patented processes. The pressure for price reductions by patent holders might not be as great as it could be for producers using a non-patented process. Additionally, it is interesting to note that

Arizona, which is a long term user of CRM HMA, and in which a market has been well established in the state and in Phoenix, pays about 242% more for CRM liquid binder than they do for conventional asphalt binder. Our estimate did not include any allowance for the failures that are bound to result from lack of experience by many states.

We agree that the increase in demand could in the long run create a downward price pressure due to the probable increase in crumb rubber suppliers. Initially, it is expected that prices will escalate due to the huge mandated increase in demand while a relatively small capacity to provide crumb rubber from a few suppliers exists. In 1992 approximately 300,000 tons of CRM HMA were used by the states, in 1993 it is expected that approximately 1,000,000 tons of CRM HMA will be placed, and in 1997 Section 1038 requires that approximately 40 million tons of CRM HMA be placed. It does not seem likely that, with a mandated increase in quantity demanded of over 130 times in five years, prices will decrease. It seems more likely that prices will increase due to the increased demand creating a shortage of supply, and that our original estimate could be low. Over time prices may level out, once supply can meet demand and competition is developed.

Following is a list of other factors which could create pressure to keep prices up, or at least make estimating future CRM HMA prices difficult:

A. Some states reported having exhausted in-state supplies of scrap tires due to the utilization of them for market based purposes. Minnesota imports tires from 5 neighboring states for market based purposes, and Connecticut reported that the New England region has utilized all of its scrap tires in the production of electricity. However, it is true that some states have large scrap tire surpluses.

B. The only supplier of crumb rubber from scrap tires in Minnesota reported that they plan to close their crumb rubber processing plant due to low profit margins. This may or may not indicate that improvements in crumb rubber production processes need to be developed before price reductions can occur.

C. The quantity of crumb rubber required by less densely populated states might not permit profits high enough to warrant a local supplier. Many states will probably have to ship scrap tires out of their state to be processed then ship the resulting crumb rubber back.

D. If patent holders are granted the patent extensions they requested upward price pressure could result.

E. Some states might not be able to get permits for their asphalt plants due to local environmental regulations. The state environmental agencies in Texas and in Michigan currently will not issue permits for asphalt plants to produce CRM HMA until proof exists that the production is safe.

F. The reported prices of CRM HMA does not necessarily reflect real costs since a number of states charge motorists tire disposal fees which subsidize the disposal costs of scrap tires. For example, Minnesota offers grants to anyone who will stockpile tires for later use.

G. Texas believes that many asphalt plants in densely populated areas will not get permits because of the state's strict emissions standards that protect adjacent landowners. This could reduce the pool of potential bidders on CRM HMA jobs in urban areas.

H. The emergence of new suppliers could be slow since the demand will not be market based and confidence could be low that regulations will create a steady demand for the product. Conversely, because of the regulations suppliers might be anxious to enter the market.

MR. CARR:

Did the AASHTO survey treat all rubber modified asphalt as identical or did it take into account that depending on the components used, the process used, the application used and the experience level of the people performing the work, very different results could result?

[the information follows]

MR. FRANCOIS:

The AASHTO survey requested information on the use of patented and non-patented processes, and on wet and dry processes. We did not request information on the experience level of the people performing the work. However, the earlier descriptions of state experiences can provide some idea of the experience level.

MR. CARR:

One of the major concerns raised about crumb rubber modified asphalt is that of recyclability. As you note in your statement (page 11), "some expert question if it can be accomplished." However, you also note on page 11 that:

> "New Jersey is the only state we found in our update effort that reported having recycled a crumb rubber modified hot mix asphalt pavement. The recycled pavement was placed less than a year ago and is performing satisfactorily."

Will you please reconcile these two statements? It sounds as though it has been accomplished.

[the information follows]

MR. FRANCOIS:

The question of recyclability still exists. This was only one test on one type of CRM HMA that failed when originally placed, using one type of asphalt binder. Just as it would be inappropriate to assume that CRM HMA does not work based upon the original CRM HMA construction, it would be inappropriate for us to say recyclability works based upon this one test. Additionally, since this recycled pavement was placed less than a year ago there is little information regarding its performance life.

Additionally, questions remain regarding the environmental impacts of this recycling project. Emissions tests were performed at the counter flow drum asphalt plant, considered to be one of the cleanest types of plants, with borderline results. Tests for hydrocarbons, carbon monoxide, and particulate were performed. They found minimal differences in the level of hydrocarbons and particulate, and significant differences in level of carbon monoxide. Carbon monoxide levels were found to just exceed the permissible levels in one test. New Jersey did not test for VOC's or aromatic.

MR. CARR:

One of the witnesses in the second panel, Mr. Carl Jacobson, maintains that crumb rubber modified asphalt may extend the life of roads by as much as five times. Did any of the respondents to your survey make comments that would support this position?

[the information follows]

MR. FRANCOIS:

None of AASHTO's member departments made any statements that would support the above position. Current use of CRM HMA is in thin layers typically used as stress absorbing membranes or as riding surfaces or overlays. The expected design life of these types of applications is significantly different from the design life of the structural portion of the pavement. For example, Florida normally expects a 5 to 8 year life from its riding surfaces and is hoping to get a 7 to 10 year life from its CRM HMA riding surfaces.

A pavement structure is typically designed to last twenty years. Mr. Jacobson's statement would imply that the life of a CRM HMA pavement could be as long as 100 years. Even Arizona and California, which are perhaps the only states that are regular users of CRM HMA for specific applications, do not make such claims. Arizona reported to us that CRM HMA overlays can reduce maintenance costs but do not extend the life of the pavements. California reported that they can make CRM HMA cost effective for one specific application by reducing the thickness of the overlay. They also reported that they might be able to increase the life of those overlays.

MR. CARR:

Mr. Jacobson also maintains that Pennsylvania is using crumb rubber in a program that is saving it $30 million yearly in maintenance costs. Do you know if this is accurate? Did such information come out in your survey?

[the information follows]

MR. FRANCOIS:

Pennsylvania did not report any information that would support the assertion of Mr. Jacobson. Pennsylvania reported that they built no asphalt rubber projects in 1992 and stated, "Our current thinking is that there is much uncertainty about the performance of asphalt rubber pavements. As a result, we intend to comply with Section 1038 in a way which minimizes the impact on our overall program. To that end, we are limiting the use of rubber to 1% (dry-process) in conventional base course mixes. We will continue to monitor the various alternatives for possible beneficial use in future years."

Upon checking with Pennsylvania we found that they use a crack sealant which contains asphalt and crumb rubber. However, Section 1038 does not consider rubberized sealants in meeting the requirements for using CRM HMA.

CT

Mr. Gary N. Hamby, HRP-CT   Division Administrator   January 6, 1993

Federal Highway Administration, 450 Main St., Rm. 635, Hartford

James F. Sullivan, Deputy Commissioner   566-3010

Transportation   24 Wolcott Hill Rd., P.O. Box A, Wethersfield

Request for Waiver of the Use of Recycled Rubber in Asphalt Pavement

CP 1/15/93

BACKGROUND

Interest in the use of rubber and other additives to improve the performance of asphalt pavement dates back to the mid 1950's in Connecticut. The early pavements were modified with both natural and synthetic rubber latex. Neither demonstrated any significant improvement over the regular mixes of the period. In the 1970's, recycled rubber was used widely in running tracks. As non-biodegradable tires were a major contributor to filling the limited remaining sanitary landfill dumps, the addition of recycled rubber to bituminous concrete was considered.

In 1973, the University of Connecticut in cooperation with ConnDOT, using HP&R funds, undertook a major research project to evaluate the use of recycled rubber in various DOT construction and maintenance activities. Full scale field tests were carried out of rubber modified thin and thick overlays, stress-relieving layers, joint and crack sealing and chip seals. Some 50 sections were placed on Connecticut highways. Follow-up performance observations indicated marginal performance improvements early on. The performance after 3 years for the rubber and non-rubber treatments was nearly identical. The economic phase of this work demonstrated that the increased costs due to the addition of recycled rubber were not justified. Subsequently additional follow-up observations in 1989 and 1992 upheld the 1980 report conclusions.

In a broader context in the late 1970's, ConnDOT efforts to expand the Department's use of recycling were accelerated. In 1978, efforts to use incinerator residue in safety improvements was researched and preliminary studies on the recycling of portland cement concrete and asphalt pavements were initiated. The latter studies resulted in specification changes to permit the inclusion of recycled black and white pavement material in Connecticut highway construction.

The late 1980's to the present has been a period of intense scrutiny of the Department's recycling programs by the Connecticut Legislature. Special studies were conducted on the use of building debris and glass in ConnDOT projects. These projects further opened ConnDOT specifications to cost-effective and environmentally safe recycling concepts and methodologies. Additional efforts to recycle plastic, paper and other items are addressed in reports to the Legislature dated 1991 and 1992. Currently, the Department is assisting the Connecticut Resources Recovery Authority in evaluating test sections using incinerator ash as embankment material and as bituminous concrete aggregate. The test sections were placed in the period of August to November 1992, with testing and performance observations to continue for several years.

Based on the above, Commissioner Frankel has issued Policy No. HWYS-43, dated March 10, 1992. Subject: "Utilization of Recycling Technology and Recycled Products on Construction and Maintenance Projects." This document delineates the DOT policy of using and encouraging recycling throughout the Department in a cost-effective and environmentally safe manner. This statement sets the tone and guides DOT actions in the general area of recycling which includes the use of recycled rubber in asphalt pavements.

My purpose in outlining the above chronology of research and action is to document the continued concern of this Department for the cost-effective reuse of materials wherever practical. Located in the densely populated Boston to Washington corridor, our engineers have long foreseen the coming material shortages and waste disposal problems and have recognized the potential impact on the economic and environmental well-being of the the State.

WAIVER REQUESTED

In accordance with Section 1038(d)(7) of ISTEA, the Secretary of Transportation is requested to waive the requirements of Sub-Paragraph (d)(1) for the State of Connecticut. The waiver is requested for calendar years 1994-1996, inclusive.

JUSTIFICATION

Recently, the Oxford Energy Company has completed and is now operating an electric generating plant in Sterling, CT. The plant uses scrap tires as a fuel source. It is permitted by the CT Department of Environmental Protection. The system was designed and is operated by the company which owns and operates the national award-winning 14.4 megawatt tire-fueled Modesto Energy Project in Westley, California.

At full capacity, the plant is designed to consume 10,000,000 scrap tires annually. Preliminary estimates were that this single plant would consume all of the scrap tires generated in the six New England States as well as a substantial number from New York and New Jersey. As a sidelight, the New England Consortium was having a difficult time finding scrap tires for a research project recently started. The Sterling Plant was cited as the reason for this shortage. At the present, tires are shipped in from as far as Philadelphia.

As the scrap tires enter the plant, they are screened manually. Approximately 15% are culled from the waste, retreaded and exported to foreign countries. When consumed as fuel, the scrap tires produce enough electricity to power as many as 30,000 homes. In turn, the by-products produced by burning -- slag, flyash, and gypsum, will be recycled into: roadbed and cover materials; reclaimed for zinc oxide for sale to metal refiners; and, reprocessed for use as a soil conditioner and used in the wallboard industry, respectively.

What are the relative benefits? Either use disposes of the tires. In a northern climate, rubber modifying the binder does little to reduce low temperature cracking, so adds little to pavement life. Fueling the generating plant reduces the amount of coal or petroleum needed for power generation. There is some concern about the health problems related to prolonged exposure of rubber to the high temperature of mixing and placing recycled rubber-asphalt mixes. This concern has been raised in other states, i.e., Maryland, Texas, California, etc.

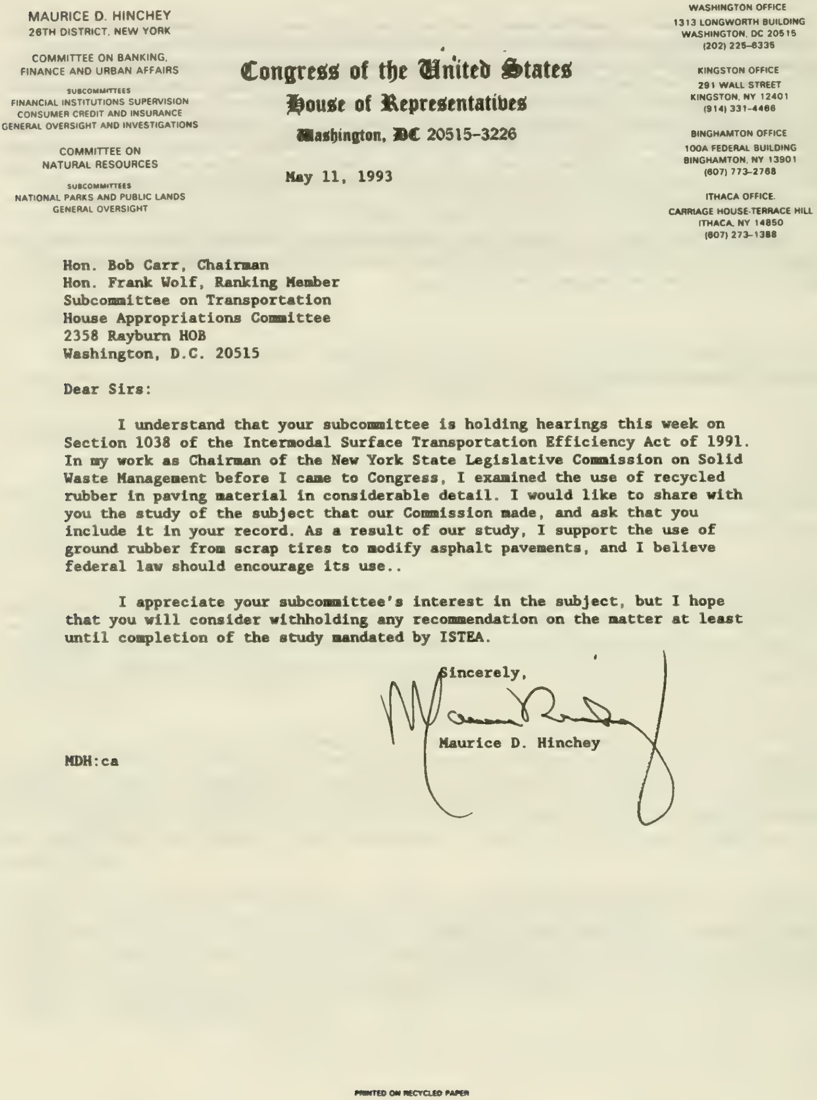
Economics should receive some consideration. Processing the rubber for either use is expensive but at the generating plant the rubber replaces expensive fuel. In the pavement, the rubber is an extra cost. If used large scale in asphaltic concrete, alterations will be needed at the mix plants. As this generating plant can utilize all local tires, diverting tires into pavement will create competition for the scrap tires resulting in a shortage of material. In turn, this can be expected to result in price increases. Requiring the use of recycled rubber in bituminous concrete will at the very least double the unit costs and result in a sharp reduction in lane miles resurfaced each year. This action would serve to set our Infrastructure Renewal efforts back to pre-Mianus River Bridge levels.

Based on the above, it is believed that the highest and best use of scrap tires in Connecticut is as fuel for the Sterling Energy Plant. Your early action to secure approval of this waiver request is solicited.

Charles E. Dougan/gp/hamby2/corr.

Mr. CARR. We will include prepared statements submitted for the record on the part of those who couldn't attend.

[The information follows:]



MAURICE D. HINCHEY
26TH DISTRICT, NEW YORK

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May 11, 1993

Hon. Bob Carr, Chairman
Hon. Frank Wolf, Ranking Member
Subcommittee on Transportation
House Appropriations Committee
2358 Rayburn HOB
Washington, D.C. 20515

Dear Sirs:

I understand that your subcommittee is holding hearings this week on Section 1038 of the Intermodal Surface Transportation Efficiency Act of 1991. In my work as Chairman of the New York State Legislative Commission on Solid Waste Management before I came to Congress, I examined the use of recycled rubber in paving material in considerable detail. I would like to share with you the study of the subject that our Commission made, and ask that you include it in your record. As a result of our study, I support the use of ground rubber from scrap tires to modify asphalt pavements, and I believe federal law should encourage its use..

I appreciate your subcommittee's interest in the subject, but I hope that you will consider withholding any recommendation on the matter at least until completion of the study mandated by ISTEA.

Sincerely,

Maurice D. Hinchey

MDH:ca

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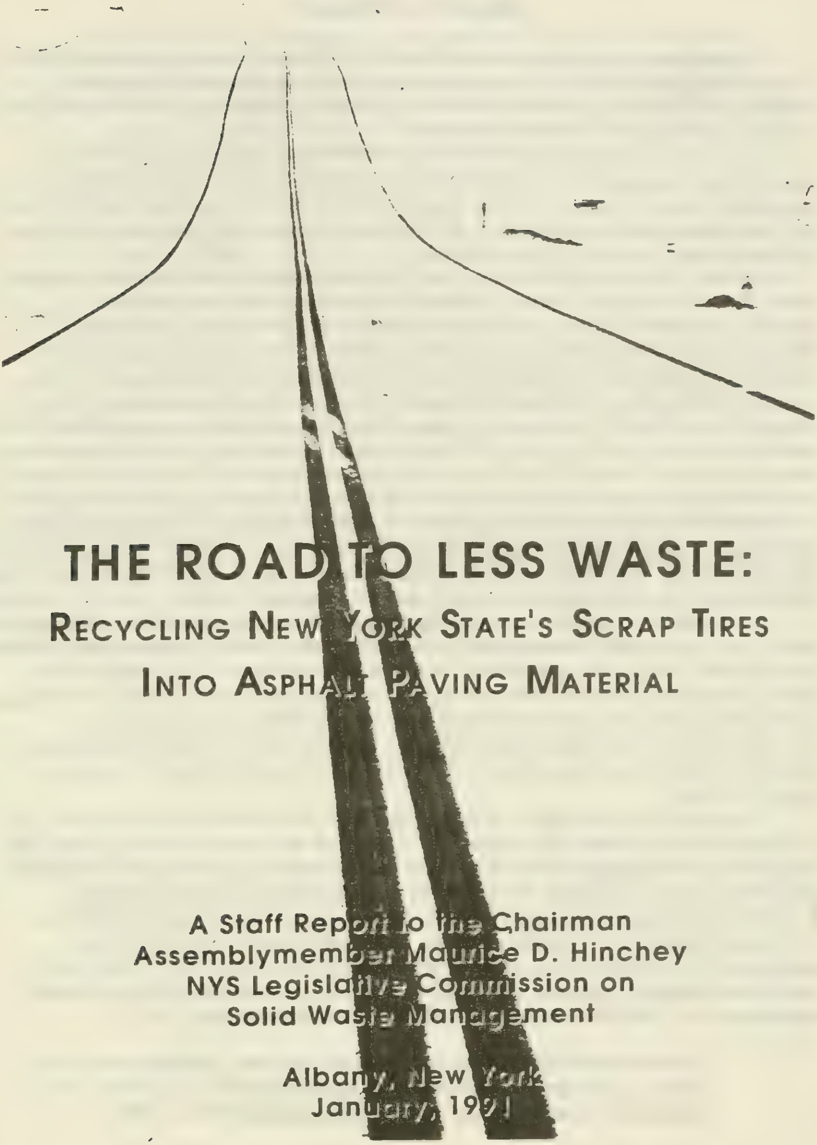

THE ROAD TO LESS WASTE:

RECYCLING NEW YORK STATE'S SCRAP TIRES INTO ASPHALT PAVING MATERIAL

A Staff Report to the Chairman
Assemblymember Maurice D. Hinchey
NYS Legislative Commission on
Solid Waste Management

Albany, New York
January, 1991

EXECUTIVE SUMMARY

Landfilling and stockpiling are New York State's leading means of scrap tire disposal. These "management methods" are imprudent, even dangerous practices that consume valuable landfill capacity, create ideal breeding grounds for disease carrying mosquitos, and can erupt into blazing environmental disasters.

A number of alternatives to landfilling and stockpiling have long been identified, including tires-to-energy incineration projects and a variety of uses for crumb rubber from scrap tires. One of the most promising management methods for scrap tires is one that State and local governments can play a direct role in: recycling waste tires by giving them a new life "on the road," in asphalt paving material.

In 1987, recognizing the potential that "rubberized asphalt" might hold as a secondary market for scrap tires, the Legislature directed the New York State Department of Transportation (NYSDOT) to undertake test projects to explore the feasibility of this material. As discussed in this report, based upon the NYSDOT project and corresponding work done by other states, it is believed that New York State can recycle its entire annual scrap tire output of 12 million tires, and begin to reduce our dangerous stockpiles, with routine use of the exact type of generic **Rubber-Modified Asphalt Concrete (RUMAC)** mix tested by the New York Department of Transportation 17 months ago. It is the conclusion of this report, however, that NYSDOT needs additional encouragement to expand their use of this material, beyond the tests required by the 1987 Law. A recent Executive Order issued by Governor Mario Cuomo pertaining, in part, to "rubberized asphalt" [see appendix] may provide some measure of encouragement to NYSDOT, but does not go far enough. *This report recommends a legislative mandate of RUMAC use through further NYSDOT test projects around the state, followed by a program of routine use by 1997.*

A variety of test results from throughout the past 10 years indicate that "rubberized asphalt" performs as well as conventional asphalt, and even outperforms conventional asphalt in many cases. Despite this performance record, there is evidence of an institutional bias against the use of this material from both the public and private sectors. Some of this bias is rooted partly in concerns over the increased costs that are likely to be associated with incorporating rubber into asphalt paving material; however, a desire to simply maintain the status quo in paving materials appears to be at the heart of much of the anti-"rubberized asphalt" sentiment.

Maintaining the status quo is something that New York State can ill afford when it comes to questions of scrap tire management. **New York State must develop a Scrap Tire Utilization and Management Plan to advance the management of scrap tires through the means listed below. The plan would involve the Departments of Transportation (NYSDOT), Economic Development (DED), Environmental Conservation (DEC), and the Thruway Authority. Program elements of the plan would be funded by the enactment of a $2.00 surcharge on the sale of all new tires sold in New York State, which would raise an estimated $26.2 million annually. Among the program elements recommended for the State Scrap Tire Utilization and Management Plan:**

> **1) Through NYSDOT and the Thruway Authority, utilizing New York State's scrap tires in asphalt paving applications on at least 50% of the annual state surfacing and binder course paving work by 1997.**

2) Under DED, promoting the development of an in-state scrap tire recycling infrastructure to produce the rubber supply necessary to meet state demand in asphalt applications. Development of such a scrap tire recycling infrastructure needs to include outreach to current tire processors and other interested parties, and a program of grants and loans to small businesses for the development of other promising scrap tire recycling technologies.

3) Under DEC, developing a regulatory plan to a) determine the current inventory of stockpiled tires, as well as annual scrap tire generation data; b) promote the remediation of scrap tire stockpiles, as well as those scrap tires accumulated at municipal landfills by directing them to tire processing facilities or permitted storage sites; c) provide outreach information to municipalities and businesses on state requirements for scrap tire transport, and the best management options available for scrap tires; and d) investigate and determine the feasibility of using shredded or ground rubber from scrap tires as an allowable landfill cover material.

With these program elements in place, New York State can begin to solve its scrap tire problem. However, one matter is beyond the State's control: the Federal Highway Administration (FHWA) has not yet approved "rubberized asphalt" as a paving material that qualifies for federal funds *in routine use*. Until the FHWA changes this policy, New York State can only qualify for federal funds in the use of "rubberized asphalt" on *an experimental use basis*. If the FHWA policy has not changed by 1994, it is questionable as to whether New York State will be able to meet the routine use goal outlined in #1 above.

OVERVIEW OF THE SCRAP TIRE PROBLEM

New York State contributes 12 million scrap tires[1] to the estimated 279 million scrap tires that are generated annually in the United States.[2] The vast majority of these tires are now landfilled in a whole or shredded condition, or are piled high in scrap tire storage facilities.

In landfills, whole tires do not remain buried because they have a tendency to shift, float upward, and destabilize the site. Consequently, few landfills continue to take scrap tires for disposal, which has led to the situation that exists in New York State today: some scrap tires are landfilled, some are illegally dumped along roadsides, in wetlands, etc., but most tires end up in vast tire storage piles, which pose health threats to our citizens.

The environmental and health threats associated with scrap tire stockpiles come from two sources: insects and fires. Tire piles provide excellent breeding grounds for mosquitos. These insects breed in the hollow inside section of the tire that traps water. Their rate of reproduction is as many as 4000 times faster in the tires than in a natural environment.[3] Mosquitos breeding in the tires have been identified as carrying various types of encephalitis, yellow fever, and dengue, a disease causing headaches, rashes and joint pain.[4]

Scrap tire piles also pose a serious risk to health and the environment because of their reaction when ignited. When tire stockpiles burn, a thick black smoke is produced and toxic pollutants are emitted. The burning tires also produce, in effect, a run-off of petroleum from the tires, or an "oil spill," which complicates matters for two reasons: first, the synthetic crude oil produced in the fire enables the fire to spread quickly, making its control extremely difficult; second, the oil combines with water used to fight the fire, and seeps into the ground, contaminating the soil and possibly the groundwater.

Costly Disasters

The disastrous consequences of a tire dump fire are illustrated by the three most recent such fires in the region.

In February, 1989, a tire dump in Catskill, New York, estimated to contain 2,000,000 tires, erupted into flames - the handiwork of an arsonist. The fire forced the evacuation of people living within a two and one half mile radius of the site, [5] and it took one week to contain the fire (with the assistance of fire departments from at least five counties). Today, however, smoke and acrid odors continue to drift from the area, some two years later. The cost to the environment is largely unknown at present, but the financial tally is clear: approximately $2 million dollars has been expended between local, state, and federal governments. [6] The Town of Catskill alone has documented $349,000 worth of expenses attributable to the tire fire. [7]

In February, 1990, the largest tire fire ever in North America, estimated to involve 14 million scrap tires, burned for 17 days near Hagersville, in the Canadian province of Ontario.[8] It was estimated that the heat of the fire reached 4,532 degrees Fahrenheit. It cost $1.5 million to put out the fire, and Ontario officials estimate that the fire clean-up costs to the provincial government alone will exceed $14 million.[9]

Most recently, in November, 1990, a scrap tire pile of 5 to 6 million tires in Tabernacle Township, NJ, was ignited by an arsonist. Fortunately the heavy equipment needed to contain the fire was obtained quickly, and the fire only burned for 24 hours, incinerating approximately 1 million tires.[10]

Scrap tire stockpiles will undoubtedly continue to be a target of arsonists; yet the tires continue to be stockpiled ever higher, for a lack of alternatives.

Alternatives to Tire Stockpiles

Nationally, close to 85% of all scrap tires are landfilled or stockpiled today. However, not all scrap tires go to waste. An estimated 38 million tires are retreaded annually,[11] but this market is almost exclusively for large truck tires, and eventually even the retreads require disposal.

Facilities that burn tires for energy recovery, including the Oxford tires-to-energy plant in Modesto, CA and several manufacturing operations that use tires as supplemental fuel sources, presently account for about 8% of annual scrap tire disposal nationally.

The remaining management methods for scrap tires largely consist of exporting tires overseas for use as fuel in cement kilns and other manufacturing operations; creating artificial reef environments; pyrolysis combustion to recover oil, char, and steel; and shredding, grinding, and/or treating tires with chemicals to produce various fabricated products or reclaimed rubber compounds that can be used for new tires, athletic surfaces, dock bumpers, railroad crossings, inks for copiers, and asphalt additives.

It is this last secondary use, reclaiming scrap tire rubber for asphalt additives, which appears to have the greatest potential for recycling vast numbers of scrap tires.

INCORPORATING SCRAP TIRES IN ASPHALT

More than twenty years of experience in a variety of state projects has shown that one of the most promising beneficial ways to utilize scrap tires is to grind them into fine rubber particles or "crumb rubber," which can be added to the asphalt used in road pavement. Each year, approximately 490,000,000 tons of asphalt are laid in the United States.[12] One ton of asphalt mixed with rubber can accommodate three to six tires, depending on the means by which the rubber is incorporated.

Processing the Scrap Tires

Crumb rubber can be produced in several ways. The first is from the grinding of whole or shredded tires using cracker mills, which are two drums rotating against each other at different speeds. When dropped between the drums, the tire is broken down to fine rubber; then the tire's steel fabric and beads are removed.

The second procedure used to make crumb rubber is through the use of whole tire granulation systems. The "bead" is first removed from the tire, and the rubber is then broken down into fine pieces through the granulator. Both cracker mills and granulators are identified as examples of "ambient grinding," or grinding tires at room temperature. Approximately ten to twelve pounds of rubber from an eighteen to twenty pound passenger vehicle tire can be obtained from ambient grinding. The remaining materials, fabric and steel belting, can be recycled, and are marketed separately from the rubber.[13]

Crumb rubber is also produced from "buffings." Buffings are rubber from the tread portion of the tire only, and are more costly than rubber produced by shredding whole tires. They are produced incidentally as a byproduct from the tire retreading process, and are used chiefly in molded or fabricated products.

Types of "Rubberized Asphalt" Applications

Once crumb rubber is produced, there are two ways in which it is added to the asphalt. The first process is often referred to as the "wet process." Developed in the 1960's by Charles McDonald, an engineer working for the City of Phoenix, Arizona, the "wet process" is primarily used to patch deteriorating pavements. The rubber particles are blended with asphalt at a ratio of anywhere from 16% rubber/84% asphalt to 25% rubber/75% asphalt. The rubber and the asphalt are reacted for approximately an hour at 350-425 degrees fahrenheit. This blending causes the rubber particles to swell. **Asphalt Rubber (AR)** is the resulting product. The rubber in this product acts as a binder, to hold the aggregate in place. The process used to make Asphalt Rubber and the Asphalt Rubber itself are proprietary. Special equipment is required to apply AR, and converting an asphalt plant to make make this material requires additional specialized and expensive machinery to preblend the rubber.

It is crucial that AR be prepared properly. The size of the rubber, and consistency of the mix must be carefully monitored to ensure a material that can be applied smoothly during construction.

Each ton of Asphalt Rubber contains the rubber from three tires. Approximately 3600 tires can be utilized in each mile of two-lane pavement when AR is applied as a wearing surface.[14]

The second way to utilize crumb rubber is through a **"dry process,"** which produces **Rubber-Modified Asphalt Concrete (RUMAC)**, by replacing some of the aggregate with crumb rubber particles. Aggregate of various sizes are used in asphalt paving. In order to accommodate the introduction of rubber, a certain size (or "gradation") of aggregate is removed, and replaced with up to 3% crumb rubber. Unlike the "wet process," the asphalt is not pre-mixed with the rubber before adding any aggregate. Instead, the rubber, along with other aggregate, and the asphalt are combined at the same time. In RUMAC, the rubber acts not as a binder, but as the aggregate it replaces. Specialized equipment is not needed to produce RUMAC.

Plusride is one type or brand of RUMAC. The Plusride process was developed in Sweden, then introduced in America in the late 1970's. The mix is 3% rubber, and requires about 2% more asphalt cement than a conventional asphalt mix. According to Plusride President Michael Harrington, Plusride utilizes five tires per ton of asphalt. Laying Plusride three inches thick would utilize approximately 16,000 tires per mile on a two lane road.[15] While the Plusride "recipe" is protected by patents, and a royalty fee must be paid for its use, the "dry process" itself is not proprietary.

The "New York Mix" is a generic RUMAC mixture that was specifically developed to comply with New York's current asphalt specifications, and was applied in a 1989 NYSDOT project. The "New York Mix" is now being used in projects in Canada and Oregon. As this report will show, the New York RUMAC mix offers real potential for utilizing at least 12 million scrap tires annually on our state's roads, with even greater quantities of scrap tires potentially being absorbed through increased RUMAC applications in local road maintenance projects.

At 2% rubber content, the generic "New York Mix" incorporates the rubber from 3.5 scrap tires per ton of asphalt. Laying this mixture three inches thick on a two-lane road would utilize approximately 11,483 scrap tires per mile.[16]

"RUBBERIZED ASPHALT" PERFORMANCE RESULTS

Before Asphalt Rubber or RUMAC can be credited as a significant solution to the scrap tire problem, an examination of these materials is in order. Several questions should be addressed in this evaluation:

1) What are the advantages that the producers of AR and RUMAC claim?
2) Are these claims substantiated by states' experiences with these materials?
3) What was the experience with RUMAC in the New York DOT project?

Asphalt Rubber (AR)

Producers of AR claim that adding the crumb rubber makes the asphalt more flexible than the conventional mix.[17] This added flexibility is seen as a weapon against the **reflective cracking** [see glossary of terms in appendix] that weakens our roadways. Cracks often start in the base layers of pavement. As they work their way to the surface, and crack through the top layer of pavement, it is said that they "reflect." The alleged increased flexibility in the road provided by the rubber should make the roads more durable, as it enables the pavement to better absorb the stress placed on it.

Certain DOT's around the country apply AR to decrease **rutting.** When heavy trucks are driven over pavement, they sometimes leave indentations. When this happens, "rutting" has occurred.

Although **New York State has not tested this material**, several state DOTs report that AR does provide, to varying degrees, the advantages that the producers claim. Engineers from DOTs in a variety of states have extensively researched the performance of these materials, and find using AR advantageous.

There are several ways to apply Asphalt Rubber: as a **crack/joint sealant**; a **surface treatment**; or a **hot mix.**

Arizona has used AR routinely as a crack sealant since the 1970s. Within the last three years, Arizona's DOT has expanded the use of the AR hot mix. When engineers assess the most advantageous way to deal with a road, AR hot mix is now regularly considered, along with other materials.[18]

California's DOT (CalTrans), also routinely utilizes AR. In California, on approximately 10% of the pavement projects, conventional asphalt procedures cannot be used. In these instances, AR is used.[19] In addition to this use of Asphalt Rubber, California has undertaken efforts to gain federal recognition of Asphalt Rubber as a "suitable policy option" (a classification for FHWA-approved road materials that are eligible for federal funds in routine use.) A representative from CalTrans said that the use of AR is understood, and should no longer be classified as experimental.[20]

California has been quite innovative in its use of Asphalt Rubber. In 1983, California laid an application of the mix and found that, compared to the conventional asphalt, the AR hot mix performs better on roads which experience freeze-thaw cycles. According to a report by CalTrans, the rate of crack reflection is retarded.[21] One barrier that prevents California from utilizing the asphalt rubber hot mix routinely is continuing uncertainty as to the appropriate thickness equivalency ratio between conventional asphalt and AR. CalTrans engineers know what thickness of conventional asphalt must be placed on the road to get ten years of service. They do not, however, know what thickness of Asphalt Rubber will yield the same ten year performance. CalTrans has laid pavements of AR at reduced thickness, and once this equivalency ratio is determined, the use of this material should expand, according to Jack Van Kirk of CalTrans.[22]

Connecticut's DOT has also extensively studied AR. In the 1970s, Asphalt Rubber was tested in Connecticut as a crack sealant, and overlays of various thicknesses of the mix were applied. While its performance as a sealant was quite good, the Connecticut DOT concluded that, three years after its application, the performance of AR as a wearing surface was not better than the control pavement's performance. In 1989, however, more positive results of an eight year CN DOT study were released, indicating that the AR section had indeed showed its merits, as the control section had not only twice as many longitudinal cracks as the AR section, but seven times as many transverse cracks.[23] The Connecticut experience adds further weight to the conclusion that, while Asphalt Rubber may not outperform conventional asphalt in the short run, its durability can lead to increased performance in the long run.

In Texas, Asphalt Rubber is routinely used as a crack sealant and is said to perform significantly better than conventional sealant. Although Texas has had performance success with the AR, it is not always used because it is more expensive than the conventional application. In fact, increased initial costs associated with AR have deterred more than one state from using it. Texas DOT, however, is still optimistic about Asphalt Rubber and continues to investigate the feasibility of expanding its use.[24]

Other states' DOTs report mixed experiences with Asphalt Rubber. Officials in Massachusetts[25] and Maine[26] say that this material is still under study, although tests to date in those states have not demonstrated the use of AR to make a tremendous difference in the durability of the road. Testing continues, however, as Massachusetts is embarking on new ways to use AR as a wearing surface.[27]

Several states such as Georgia,[28] Michigan[29], Minnesota[30], New Hampshire[31], Ohio[32], and Pennsylvania[33], have found that the AR pavements perform either slightly better than, or about equal to, the control sections. Because of the higher initial cost of the Asphalt Rubber these state officials believe results do not yet support the use of these materials as a cost effective substitute to conventional asphalt mixes. Michigan's[34], Ohio's[35], Pennsylvania's[36] and Virginia's[37] DOTs plan further exploration of AR applications.

While it is common to hear of little difference between AR and conventional asphalt sections, only one reported failure of AR used in a surface treatment has been identified. An engineer from Vermont's DOT reports that, when used in the 1970s in an application referred to as a "slurry seal," the pavement failed.[38] There are no published reports to verify the failure, or speculation as to why it may have occurred.

Some involved with Asphalt Rubber warn against conclusions based on studies conducted years ago, before procedures for applying the material were improved.[39] Since 1983, the Asphalt Rubber industry has focused on improving the techniques used to monitor the production and application of the mixes.[40] Mike Heitzman of the Federal Highway

Administration notes that, with increased use of these materials, more is learned about the nuances of their application. Proper application techniques, including monitoring the temperature and other properties of the mix, are crucial to AR's ultimate success.

While many who have used AR agree that they did not find significant differences from conventional asphalt, the use of Rubber Modified Asphalt Concrete (RUMAC) has elicited a wider variety of reactions.

RUMAC (Plusride and the New York Mix)

Plusride -- Benefits claimed by the producers of Plusride include increased skid resistance, increased flexibility in the road for longer life, along with a reduction in cracking, de-icing qualities, and a reduction in noise.[41] Data obtained from various states' tests of Plusride, conducted over the last 15 years, cannot conclusively substantiate or refute those claims.

Results of Plusride tests do show some de-icing capabilities, which could eventually reduce the amount of salt needed on the roads, if Plusride gained widespread use. Communities concerned with the impact of chlorides from road salt on water sources and the environment generally might welcome this alternative.

In Alaska, Plusride was found to decrease the stopping distance in icy conditions. Twenty one stopping tests were performed and the average stopping distance was 25% less on the Plusride sections.[42] Plusride is found on approximately one dozen road locations in Alaska. It is used when a particularly ice resistant surface is sought.[43] Work conducted in Michigan[44], Rhode Island[45], New Jersey,[46] and Washington[47], however, failed to yield similar de-icing results. Michael Harrington of Plusride claims that, in the winter of 1990, Plusride proved its de-icing qualities when a New Jersey Plusride section did not need salting on a second consecutive snowy day, and the conventional asphalt test section did.[48] John Renero, from New Jersey DOT worked on the site. He agreed that by looking at the sections, less snow appeared to have accumulated on the Plusride section. On the second day of salting, the Plusride section was, in fact, not treated. Renero, however, is cautious, claiming that the small amount of snow involved allows him to only say that Plusride *appeared* to reduce the amount of salting needed, but the extent is debatable. In addition, he noted that proper friction tests were not done; all observations were merely visual.[49] Studies done in Washington[50], Minnesota[51] and Montana[52] indicate that no de-icing qualities were observed. The Minnesota DOT[53] and Montana DOT[54] do note, however, that the dark color of Plusride may enable it to absorb heat more quickly during partly-cloudy or clear sky conditions.

CalTrans initially found the skid resistance on the Plusride section to be equivalent to the friction on the control section. Fours years following the PlusRide application, CalTrans discovered that the skid resistance counts on the Plusride improved, while the conventional pavement's skid count decreased.[55]

Rutting and raveling shorten a pavement's life, and controversy surrounds the question of how Plusride affects rutting and raveling in the road. California[56] and Alaska[57] have found that Plusride is resistant to rutting. Montana found a Plusride section to be far superior to the control, in that much more raveling and rutting occurred on the control.[58] These results are seen as quite significant, as Montana experiences freeze-thaw cycles which are very harsh on the roads. Work in Minnesota[59], Michigan[60], and in New Jersey[61] by the respective state DOTs found little difference between Plusride and the conventional pavement's resistance to these problems. Work done in the state of Washington revealed that the control section wore as well as the Plusride in regard to rutting.[62]

Plusride's ability to reduce cracks is questionable, as test results are inconclusive. In a CalTrans test of Plusride, one placement cracked prematurely,[63] while another Plusride section had significantly less cracks than the conventional section.[64] The cause for the discrepancy has not been discovered. In Montana, a Plusride section showed very little cracking, while a control section at its side showed many cracks.[65] Work in Washington yielded mixed results. One report indicates no significant reduction in cracking[66], while another implies that Plusride combatted cracks quite well.[67] Minnesota[68], and Rhode Island[69] report no reduction in reflective cracks.

While experiences with Plusride are not conclusive, generally this material has been demonstrated to perform at least as well as conventional asphalt.

According to state DOT engineers in Indiana[70], Maryland[71], Massachusetts[72], Montana[73], and Virginia[74], plans are underway to study Plusride further. In New York State, the DOT has completed test applications of Plusride and a generic RUMAC mix, and plans to monitor these strips over the next five years. Locally in New York State, Plusride tests are being planned for Suffolk County[75], and are being discussed in the Town of Babylon[76].

The "New York Mix" -- The "New York Mix" is a recent addition to the RUMAC field, and appears to offer great potential for expanded use, as it differs very little in mixing and application from conventional asphalt concrete, involves no royalty payments (compared to Plusride), and requires less technical gradation of the crumb rubber (compared to Plusride). Since the "New York Mix" is so new, however, there is less to report on in the way of results, as compared to the experiences with Plusride.

Following its development and application in New York State, the "New York Mix" has been used on a project in Ontario, Canada, with another project in the planning stages in Oregon.[77]

Field tests of the "New York Mix" are in their infancy. Based upon our review of the NYSDOT report that follows, it can only be concluded that the Department of Transportation is not inclined to voluntarily expand its use on New York State roads.

NYSDOT's RUMAC PROJECT

The New York Mix was developed as part of a NYSDOT RUMAC test in response to the requirements of Chapter 599 of the Laws of 1987 [see appendix.] Chapter 599 required NYSDOT to undertake a RUMAC pilot project and issue a report to the Governor and the Legislature containing a "summary and analysis of the procedures and results of the pilot project..." The Law detailed ten issues for NYSDOT to address in the report.*

NYSDOT selected two sites for applying the RUMAC test sections: In Albany County, Route 144 in the Town of Bethlehem; in Delaware County, Route 17, in the Town of Deposit. NYSDOT also selected the engineering consulting firm of Austin Research Engineers (ARE) to oversee the tests and issue the report required by Chapter 599. ARE subsequently signed on Dr. H.B. Takallou, an engineering consultant well-recognized in the field of rubber modified asphalt, as a sub-contractor. It was Dr. Takallou who worked with NYSDOT to develop the "New York Mix."

By all accounts from those who directly participated in the NYSDOT RUMAC pilot tests, the RUMAC applications went smoothly. The project called for test strips of a 1%, 2%, and 3% rubber granulate "New York Mix," as well as the proprietary product, Plusride, to be laid in sections of 1,000 feet at both test sites. The test strips were not laid until August, 1989, and the report on the project, required by April, 1989 under the 1987 statute, experienced significant and unexplained delays as well. Information from the New York pilot project was eagerly awaited by other states because, for the first time, a state had developed and applied its own generic RUMAC mix, rather than using only the proprietary Plusride mix, and paying the ensuing royalties. In spite of this unique national experience, however, the actual engineers' report on the RUMAC project was not what NYSDOT released. Instead, at the end of September, 1990, the Department released its own report, entitled "Use of Scrap Tire Rubber in Asphalt Pavements."

NYSDOT took thirteen months after the RUMAC applications were laid to produce an eleven page document extremely short on analysis of the actual RUMAC application. The engineers' report by ARE, for which the state paid $100,000, was used as a footnoted reference (once) in the report issued by the Department.

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*Previous to the enactment of Chapter 599, the Governor vetoed a similar bill (A. 7020-a, Hinchey) in 1985. In his veto message, the Governor directed NYSDOT to "undertake a survey of existing research into this area and...set forth the economic impact on highway repaving projects which requirements for the use of scrap rubber in asphalt paving would impose." The NYSDOT response to the Governor's directive was issued in 1986, and among its conclusions was the following: "...it is estimated that adding two percent rubber to asphalt concrete would use the equivalent of nine million passenger tires per year at an estimated total increased cost of about $100 million (a 60 percent increase over current prices), or about $11.00 per tire." NYSDOT continues to portray this figure as an accurate cost increase projection.

The NYSDOT report attempted to respond to the ten issues identified by Chapter 599 of the Laws of 1987 as requiring investigation. The following is a list of those issues, a summary of NYSDOT's conclusions, and the LCSWM staff response to the Department's findings.

1) A COMPARISON OF COSTS OF CONVENTIONAL ASPHALT MIXES TO THE COSTS OF THE USE OF RUBBER-MODIFIED ASPHALT.

NYSDOT response: "Our current estimate, based on costs experienced in the pilot projects and costs reported by others, is that future costs can be expected to be closer to 50 percent higher for rubber-modified asphalt. If the asphalt concrete used for the surface and binder courses of highway paving in New York State annually were to contain 2 percent rubber, the total annual cost of the highway program would be increased by as much as $100 million..." [pg.3]

LCSWM staff response: The central argument of the NYSDOT report is that the excessive cost of RUMAC precludes its use. RUMAC does indeed cost more than conventional asphalt, but the Department's economic analysis is faulty. The analysis that RUMAC application increases costs by 50 percent over conventional asphalt is largely based on use of the winning bids awarded by NYSDOT in the RUMAC pilot project. These bids, however, are not an accurate reflection of the cost differential between RUMAC and conventional mixes for several reasons. First, the amount of RUMAC involved in the pilot project was not a production-run quantity, and was undertaken on such a small scale that the cost used by NYSDOT is at an artificially high level. Second, the winning contractor bids for the pilot projects priced all rubber modified mixes the same, regardless of the additional rubber content (1, 2, or 3%). This does not accurately reflect the varying cost of rubber-modified mixes, which, in turn, leads to the conclusion that these RUMAC mixes were bid high, as a nuisance item, enabling the contractors to underprice the 5,050 tons of conventional asphalt mix used in the project, adding further to the mischaracterization of the cost difference between the conventional and RUMAC mixes. Finally, the NYSDOT analysis fails to account for differences in material yield in the cost comparison between conventional asphalt and RUMAC. On a per ton basis, RUMAC provides more paving material at less weight than conventional asphalt, because the rubber in RUMAC occupies greater volume than regular aggregate, but weighs less. By adding 2% rubber to an asphalt mix, an additional material yield of 6.5% per ton over conventional asphalt is realized. "

The NYSDOT report cites other factors that cause RUMAC to be more costly than conventional asphalt mixes, but this analysis is fraught with error, interchangeably confusing, for instance, the wet process (Asphalt Rubber), with the dry process (RUMAC.) Adding further to the confusion, the report also lumps two different types of RUMAC together in the analysis: the proprietary product Plusride, and the generic "New York Mix." For example, one factor mentioned as contributing to increased RUMAC cost factor is "increased energy to heat the asphalt mix to the higher temperature required for a rubber-modified mix." The average mix temperatures for the NYSDOT RUMAC project mixes were within the normal temperature ranges (250 - 325 degrees fahrenheit) for conventional NYSDOT 6F asphalt mix. A higher temperature range is only required for the wet process (AR), which NYSDOT wasn't even testing in the pilot project. Another example cites "the need for more costly aggregate (stone) and filler gradation" when using rubber. This reference should have made clear that these costs were involved in the Plusride RUMAC only, not the generic "New York Mix." This "mixing up the mixes" occurs throughout the NYSDOT report, and undercuts the analysis of costs, which the Department identifies in the end as the principle impediment to increased RUMAC use.

2) A COMPARISON OF THE APPLICATION METHODS OF CONVENTIONAL ASPHALT PAVING MATERIALS TO RUBBER-MODIFIED ASPHALT AND THE ABILITY TO ADAPT EQUIPMENT AND PROCESSES, IF NECESSARY, TO INCORPORATE RUBBER IN ASPHALT MIX TO THE COMMISSIONER'S SPECIFICATIONS.

NYSDOT response: "For the pilot projects, the normal process for laboratory mix was modified on a judgement basis to accommodate the addition and presence of crumb rubber." The Department notes that the preparation and application of RUMAC mixes are "similar but more complex" than conventional asphalt mixes, and refers to "...the added complexity of having to add a controlled amount of granulated rubber into the mixing drum," and "difficulties encountered in obtaining a rubber-modified asphalt with an acceptable gradation." The report also identifies "an increased tendency for smoke to be emitted, and the creation of a burning rubber smell." Based on this observation, the report recommends that "The potential health effects at the plant site should be evaluated if use of rubber-modified asphalt is to become widespread, given the high carbon black and petroleum derivative content of the rubber in tires." The DOT report notes that the RUMAC mix, both the generic at 3% rubber and the Plusride mix especially, "tends to be sticky, adhering to the equipment and to the dump truck bed...was difficult to move and did not appear to compact well under the weight of the rollers...the rollers had to be kept wet with water to which a soap or detergent was added." [pgs. 4-5]

LCSWM staff response: First, the NYSDOT characterization of changes occurring to the mix on a "judgement basis" is presented largely as "guesswork." This, however, was not the case, with mix design criteria based upon a 1988 report to the U.S. Transportation Research Board by Dr. H.B. Takallou.[7] Second, much of the "complexity" described by NYSDOT in dealing with RUMAC is attributable to working with a new material, much as any new "recipe" requires more attention to detail, until, through repeated use, it becomes standard practice. Some of the "complex" issues cited by DOT, however, are baffling. These include the apparent mysteries of adding a "controlled amount of granulated rubber" to the mix. The granulated rubber was in 20 pound bags. For the 1% rubber "New York Mix," this meant adding one bag in the mixer; for the 2% mix, two bags; and for the 3% mix, three bags. The bags were pre-weighed and were simply added into the mixer, bag and all. Third, the "mixing up the mixes" situation occurs here again, when reference is made in the NYSDOT report to the "difficulties encountered in obtaining rubber-modified asphalt with an acceptable gradation." This refers to Plusride only, where gradation of the crumb rubber needs to be more exact than that required by the specifications of the "New York Mix." The reference to "an increased tendency for smoke to be emitted" has not been confirmed by any person actually at the project sites, and was, in fact, disputed by several persons. There is consensus that a "burning rubber smell" can be detected, and was the subject of complaint by several workers at the Albany site. Recent tests relating to the health effects of working with RUMAC vis a vis conventional asphalt have been conducted by the provincial government of Ontario, Canada, as part of a larger $5 million RUMAC project. Sophisticated air monitoring equipment was set up on a RUMAC test site, and attached to workers as well. According to an environmental chemist who conducted the tests, initial results have so far revealed no difference in emissions between the conventional asphalt and RUMAC. "

The final reference to the "stickiness" of the Plusride and 3% rubber generic RUMAC mix has some basis in fact. Conversations with a variety of individuals involved in NYSDOT RUMAC tests reveal that, at 3% rubber, RUMAC is noticeably thicker and darker than either the conventional asphalt or the 1% and 2% rubber mixes. The "stickiness" that did accompany the 3% RUMAC mixes, however, did not interfere with successful application, and while the NYSDOT report indicates that the rollers had to be kept wet with water and soap to prevent sticking, "soaping" of the rollers not a practice unique to RUMAC applications. Soaping of the rollers is often done in the application of conventional asphalt as well.

3) PERFORMANCE OF RUBBER-MODIFIED ASPHALT AS COMPARED TO CONVENTIONAL MATERIALS WITH REGARD TO LONGEVITY OF PAVEMENT, TRACTION, ROAD GLARE, ICING, AND SUCH OTHER CHARACTERISTICS AS MAY BE DEEMED APPROPRIATE BY THE COMMISSIONER.

NYSDOT response: "While laboratory tests of the material's characteristics imply there should be a degree of improvement, no significant improvements have been demonstrated in actual field performance. Although there have been many anecdotal reports of improved performance from rubber-modified asphalt in terms of service life, improved stopping distance and ability to reduce the bonding of ice to pavement, such performance has not been shown in controlled field tests of the material." [pg. 6]

LCSWM staff response: The NYSDOT report is simply wrong on this score. A variety of states, with climate conditions that are either comparable to or more severe than New York's have found through field tests that RUMAC has demonstrated significant improvements over conventional asphalt in certain categories. This report has already cited many such examples. Long term performance results of RUMAC are now being confirmed from some of the earlier applications. These experiences would appear to confirm the conclusions of laboratory test results for RUMAC, which the Department continually seeks to discount throughout its report.

4) THE FINDINGS OF THE COMMISSIONER AS TO THE OPTIMUM AND APPROPRIATE PERCENTAGE OF SCRAP RUBBER IN RUBBER-MODIFIED

ASPHALT PAVING MIXTURES FOR CONSTRUCTION OR IMPROVEMENT OF STATE HIGHWAYS IN CONSIDERATION OF PROJECTED PERFORMANCE, SAFETY, AND COSTS.

NYSDOT response: "Monitoring of these sites will be required for at least five years before it can be expected that there will be any indication of differences amongst the rubber-modified asphalt mixes and in comparison to conventional asphalt mixes...[because of cost] its use can be justified only if it will have a longer service life, improved safety characteristics, or other such attribute to warrant the higher cost, or from a public policy standpoint it is determined that use of scrap tires in highway asphalt is the preferred method of disposal. The life-cycle costs...can only be determined once the test sections have been in place for possibly as long as ten or more years, in order to obtain a realistic assessment of performance and safety...while there is no optimum value of crumb rubber percentage that can be selected at this time, a one or two percent crumb rubber content appears to be a reasonable amount to assume for comparison purposes." [pg. 7]

LCSWM staff response: While staff agrees that monitoring of the test sites in Albany and Delaware counties, including test core samples and skid tests, must be carried out over the next five years, it is clear that further use of RUMAC in New York State need not wait for five years. "Realistic assessments" of RUMAC's performance and safety have already been provided in a variety of tests conducted throughout the last ten to fifteen years.

An expanded testing program, with applications of 1,2, and 3% "New York Mix" RUMAC should be applied at various locales around the State, in production run quantities, to begin providing further information about this material's costs, and to provide contractors with further exposure, in terms of bidding on RUMAC projects and working with the material. The approach recommended by the Department would require approximately 10 more years of waiting before RUMAC is deemed to have performance potential for widespread use on state roads, if at all. Extensive laboratory and field tests of RUMAC had been conducted prior to the passage of the 1987 Law requiring NYSDOT to undertake the RUMAC pilot project. Further developments have occurred since 1987. The results of these tests recommend RUMAC's use at present, not *perhaps* ten years from now.

A range of other RUMAC benefits, in addition to road performance, include: 1) avoided costs of scrap tire disposal, reduced need for regulatory oversight, and fewer environmental clean-ups - amounting to millions of dollars each year - by beneficially reusing tires instead of stockpiling; 2) avoided maintenance costs, *assuming a longer life for roads where RUMAC was applied*, as has been evidenced in lab and field tests; and 3) job creation and economic development in the State through the creation of a new tire processing infrastructure that could add $12 to $20 million to the economy of the State."

As to the "optimum percentage" of scrap rubber content in RUMAC, staff contacts with a variety of individuals who have worked on RUMAC projects (including individuals directly involved in the construction of the NYSDOT pilot projects in Albany and Delaware counties) indicate that 2% - 3% rubber content in asphalt paving is an optimum percentage.

5) THE QUANTITY OF RUBBER THAT WOULD BE USED ANNUALLY IF THE PERCENTAGE OF RUBBER CONTENT RECOMMENDED BY THE COMMISSIONER WERE TO BE UTILIZED IN RUBBER-MODIFIED ASPHALT PAVING MIXTURES FOR ALL CONTRACTS FOR THE CONSTRUCTION OR IMPROVEMENT OF STATE HIGHWAYS OR SECTIONS THEREOF.

NYSDOT response: "If cost were of no concern, it is estimated that it would be possible for nine million scrap tires in the form of crumb rubber to be used in state highway paving materials annually...However, other uses are being made of tires [petroleum extraction and Oxford Energy's incineration technologies are highlighted.] Once these plants are on line, there may no longer be a tire disposal problem in the Northeast. However, the plants will create a market for tires with the potential for the cost of scrap tires to rise above that used as a basis for estimating the cost of rubber-modified asphalt...The Department believes that any recommendation at this time to make widespread use of scrap rubber tires in asphalt would be inappropriate and premature." [pg. 8]

LCSWM staff response: NYSDOT provides no basis for its utilization figure of nine million scrap tires. As stated earlier in this report, at 2% rubber content per ton of RUMAC, 3.5 tires are recycled. The used rubber from 12 million tires generated annually in New York would be consumed in 3.4 million tons of asphalt mixture. This amount of asphalt is slightly over half the amount used by the state for road surface and binder courses that could benefit from RUMAC applications. If the state were to commit to using RUMAC on all surface and binder applications, approximately 24 million scrap tires would be recycled annually. If local governments were to use RUMAC as well, millions more scrap tires would be recycled. None of this, of course, could occur overnight; nevertheless, the capability of the state to absorb scrap tires in asphalt applications appears well beyond the nine million tires stated by NYSDOT.

Responding to the directive of Chapter 599 as to the estimated quantity of rubber that could be used if RUMAC was used on all state highways, the NYSDOT report prefers instead to focus on opportunities for scrap tires other than using them in RUMAC. The report discusses at length the proposed Oxford Energy tire incineration facility in Lackawana, and a similar plant in Sterling, CT, due to open shortly. The discussion, however, betrays a total lack of understanding on the part of NYSDOT as to the economics of these facilities. The report views these plants as creating a market demand for scrap tires, and driving the cost of scrap tires upwards, in turn making RUMAC more expensive. The report fails to understand that these facilities don't *purchase* the scrap tires, but instead *charge* a tipping fee of approximately $1.00 for every tire they take in. This shortcoming of the NYSDOT analysis only further skews its review of the economics associated with RUMAC use.

6) EXISTING OR POTENTIAL IMPEDIMENTS TO THE MAXIMUM UTILIZATION OF RUBBER-MODIFIED ASPHALT IN CONTRACTS FOR THE CONSTRUCTION OR IMPROVEMENT OF STATE HIGHWAYS.

NYSDOT response: "The major impediment...is one of cost. The cost of using rubber-modified asphalt for the two pilot projects was from 50% greater in one project to 129% greater in the second project, compared to using a conventional asphalt mix." The report also discusses the need to develop "appropriate new techniques to evaluate the adequacy of compaction of the rubber-modified asphalt, satisfactory resolution of the questions of health and environmental effects of use of the rubber material at high temperature, as well as questions of recyclability of the material, and ability to meet the increased energy consumption associated with use of the material." The report then cites a 1986 report, also issued by the Department, which calculated the potential cost of using scrap tires in asphalt as $11.00 per tire. "What was concluded then, and is the conclusion of this report, is that added cost would not assure that an improved performance, life cycle cost, or safety would result." Finally, "...other productive uses of scrap rubber tires have been developed, with plans to apply them under construction or being actively considered. These other uses have promise of fully using the projected scrap tire waste stream, including the existing stockpiles of scrap tires." [pg. 9]

LCSWM staff response: NYSDOT correctly notes that the major impediment to increased RUMAC utilization is one of cost. No attempt is made, however, to provide an economic analysis that might project costs of RUMAC in routine use, or even in a production run quantity. The bid prices awarded by NYSDOT in the RUMAC project are not an accurate reflection of RUMAC's actual cost; indeed, no satisfactory explanation is even attempted for why the winning bid for the Delaware County RUMAC test was 129% over conventional asphalt. This bid is so completely out of line that one can only speculate as to why the Department didn't re-bid the project.

The Department's reference back to its 1986 report, which suggested the cost of RUMAC would amount to $11.00 per scrap tire used, only serves to further highlight the short shrift given to questions of RUMAC's economics. No economic analysis has ever been offered to justify that $11.00 per tire projection, yet it is still used. More reliable, in the opinion of staff, is an analysis by Dr. H.B. Takallou, based on recent costs of rubber granulate, asphalt cement, and labor and equipment from a Canadian RUMAC project, which puts the cost of RUMAC at $1.21 per tire used (see page 24 of this report.)

Other issues raised by NYSDOT in this study, and referenced in their 1986 report, are "lifecycle cost" and "safety." These matters are simply red herrings. The "safety" of RUMAC (and AR) is not even debatable unless one is talking about eating the material as opposed to paving with it. As to "lifecycle cost," the Department wants guaranteed RUMAC performance results that just don't exist. NYSDOT appears to maintain a position that, unless RUMAC is proven to last 20% longer than conventional asphalt, it is unwise to pay 20% more for the material. The facts are that in many applications, results indicate that RUMAC has outperformed conventional asphalt. In most applications, RUMAC is performing at least as well as conventional asphalt. In a few rare applications, RUMAC has not performed as well as conventional asphalt. The results are not *conclusive*. The NYSDOT argument is that without conclusive evidence of an increased lifecycle to match the increased cost, RUMAC should not be used. Staff rejects this approach as short-sighted. Conclusive life-cycle data may be available in ten years, but other factors that favor the use of RUMAC are apparent now: The performance data on RUMAC is favorable; the economics, when factoring in avoided costs, are favorable; and the State's waste management hierarchy, which supports the recycling of secondary materials over their disposal, is favorable. All of these points argue for an expansion of RUMAC use by NYSDOT.

The Department's report does raise the unresolved issue of RUMAC's recyclability. Asphalt pavement is often taken off a road, mixed with fresh asphalt, heated, and re-applied to the road. (In 1988, approximately 10% of the total asphalt placed by NYSDOT was "recycled.")[12] Existing RUMAC applications have never been tested for recyclability, although there are plans, in the spring of 1991, for an on-going RUMAC project in Canada to test the RUMAC pavement for recyclability. Whether or not RUMAC pavement can be recycled will soon be resolved. This one factor, however, should not be the sole basis for refusing to move forward with further RUMAC applications in New York State.

In this section of their report NYSDOT once again notes that there are other ways to use tires, presumably referring to their incineration at specialized plants, which "have promise" of fully using the scrap tire waste stream, including stockpiles. This emphasis, however, ignores the priorities assigned to reuse and recycling under the State's waste management hierarchy. It is the equivalent of suggesting that most newsprint and office paper generated in this state can be more efficiently incinerated, rather than recycled. Spending money to burn recyclables is a waste of resources, particularly in light of the recycling potential of scrap tires. While some may be eager for the quick fix of tire disposal, it is vital to consider scrap tires as a material resource that can be recycled on our roads if enough emphasis is given to the State's role in creating the demand for RUMAC and AR.

7) RECOMMENDATIONS OF THE COMMISSIONER AS TO FUTURE ACTIONS THAT COULD BE TAKEN BY THE DEPARTMENT OF TRANSPORTATION, THE GOVERNOR, AND THE LEGISLATURE TO FACILITATE THE USE OF SCRAP RUBBER FOR HIGHWAY CONSTRUCTION OR IMPROVEMENT.

NYSDOT response: Again suggesting that the cost differential between RUMAC and conventional asphalt is $11.00 per tire, the NYSDOT report states that if tire purchasers were "required to pay that amount into a tire disposal fund to be used to equalize the cost of rubber-modified asphalt and conventional asphalt mixes, it would eliminate this major impediment...however, such a large assessment on tire purchasers would represent a significant increase in the cost of tires...Since other promising, productive and cost effective uses of scrap rubber tires will soon be coming on line...it appears that it would be neither necessary or appropriate at this time to engage in any more widespread pilot test projects using rubber-modified asphalt, or to address the environmental and health concerns, the investment in plant equipment, training of workers, etc., relating to such use of scrap rubber tires." [pgs. 9-10]

LCSWM staff response: The NYSDOT completely fails to address this directive of the Law in its report. The report commissioned by NYSDOT from Austin Research Engineering, for which NYSDOT paid $100,000 and never publicly released, does address this issue, however. It includes the following suggested actions that could be taken: "recycling taxes on tire purchases or disposal taxes to consumers, funding or incentives or rebates to municipalities, alternate bids, mandatory use requirements, and tax incentives to promote its use." [23] The ARE report further suggests that "To encourage more realistic pricing, it will be necessary for NYSDOT to develop additional projects, to encourage competition, and offer technical support to the contractors until they learn to design and produce rubber-modified mixes under normal contracting procedures" [24] NYSDOT's resistance to expanding the use of RUMAC is clearly illustrated by its failure to properly address this issue, or even speak to its own consultant's recommendations.

8) AN ANALYSIS OF THE POTENTIAL FOR THE USE OF RUBBER-MODIFIED ASPHALT BY LOCAL GOVERNMENTS, REGIONAL AND STATEWIDE AUTHORITIES, GOVERNING THE CONSTRUCTION OR IMPROVEMENT OF HIGHWAYS OR BRIDGES, INCLUDING, BUT NOT LIMITED TO: A) THE PROJECTED ANNUAL DEMAND FOR SCRAP RUBBER BY LOCAL GOVERNMENTS, REGIONAL AND STATEWIDE AUTHORITIES, BASED UPON THE PERCENTAGE MIX IN ASPHALT FOR RUBBER DERIVED FROM MOTOR VEHICLE TIRES RECOMMENDED BY THE COMMISSIONER; AND B) KNOWN OR ANTICIPATED IMPEDIMENTS TO THE MAXIMUM UTILIZATION OF RUBBER MODIFIED ASPHALT BY LOCAL GOVERNMENTS, REGIONAL AND STATEWIDE AUTHORITIES.

NYSDOT response: "...about 2.5 million tires could reasonably be expected to be used by local governments and authorities annually were they to use rubber-modified asphalt instead of conventional asphalt pavement material for the wearing course of highway resurfacing projects. The major impediments...are the same as noted above for the state." [pg. 10]

LCSWM staff response: Again, the NYSDOT report uses a figure (2.5 million tires) and provides no basis for that scrap tire usage estimate. According to the Department's report, annual asphalt usage for non-state roads amounts to almost 3.8 million tons. 68% of that total is estimated to be used for pavement surfacing and binder courses (portions of road structure that could potentially benefit from the use of RUMAC.) 68% of 3.8 million tons equals 2,584,000 tons of RUMAC potential for non-state usage. Staff estimates that, with 3.5 scrap tires per ton of RUMAC (at 2% rubber addition), more than 9 million scrap tires could potentially be used by local governments, regional and statewide authorities, not the 2.5 million tires estimated by NYSDOT. It appears that the report's author(s) mistakenly referred to 2.5 million tons as 2.5 million tires.

9) ACTIONS THAT MAY BE NECESSARY TO ENSURE THE AVAILABILITY OF AN ADEQUATE SUPPLY OF SCRAP RUBBER TO MEET PROJECTED DEMAND IN THE CONSTRUCTION OR IMPROVEMENT OF PUBLIC HIGHWAYS.

NYSDOT response: "It is recommended that the appropriate state agencies and legislative committees follow the developing markets for scrap tires and to consider whether legislative action might be appropriate to assure that scrap tires are removed from the solid waste disposal stream so they can be available for productive uses." [pg. 11]

LCSWM staff response: In New York State, scrap tires are already been banned at many MSW landfills, because of their bulkiness and tendency to shift and float upward. The stockpiles currently used to store scrap tires represent vast amounts of rubber ready for processing into any form for which there is a demand. The State has the capability to create a significant demand for crumb rubber through a program to use RUMAC (with New York scrap tires) on at least 50% of its binder and surfacing courses within the next six years. Such a program could trigger tire processors currently operating in New York State to make the necessary investments in new equipment that would enable them to competitively supply granulated rubber as aggregate for RUMAC applications. Producers of this rubber would, in effect, be joining the ranks of hundreds of other aggregate producers around the State who now supply asphalt aggregate to NYSDOT and the Thruway Authority, **with one important difference:** crumb rubber aggregate producers would also be assisting the State in managing its troublesome scrap tire waste stream.

10) AN ESTIMATION OF THE ADDITIONAL EXPENSE, IF ANY, TO THE STATE OR LOCALITIES IN THE UTILIZATION OF RUBBER-MODIFIED TECHNOLOGIES.

NYSDOT response: "Current costs are from 50 percent to more than 100 percent higher. Although it is inherently more costly to produce, it has been assumed that prices would decline with more widespread use, higher volumes of production and accumulated experience and training by asphalt plant operators and contractors in its use. This has resulted in estimates that in the long term, rubber-modified asphalt might be from 25 percent to 50 percent more costly than conventional asphalt mixes." [pg. 11]

LCSWM staff response: As noted earlier, NYSDOT's basis for estimating RUMAC costs at 50 -100 percent higher than conventional asphalt is fatally flawed. It is based on a small pilot project application, and cannot be viewed as a true reflection of RUMAC costs. In order to arrive at a valid "real world" estimate of RUMAC costs, NYSDOT must bid several projects utilizing production run levels of at least 5,000 tons of RUMAC per project.

The Federal Highway Administration has estimated RUMAC cost increases to be in the 20% - 30% percent range over conventional asphalt, based on ten years of experience with the material.[15] The most recent estimate provided to staff on increased costs associated with RUMAC is about 21% over conventional asphalt, based on recent RUMAC projects. Dr. H.B. Takallou, an engineering consultant and a subcontractor on the NYSDOT RUMAC project, furnished the following data:

Extra Cost Per Ton At 2% Rubber Addition

Asphalt Cement	
.8 percent increase/ton	$ .98
Rubber Granulate	
2% per ton of mix	
(40 lbs. @ 13 cents per pound)	5.20
Expense for Addition of Rubber	
Labor and equipment costs/ton	.53
Total of Extra Costs for Using RUMAC Over Cost of Conventional Mix	$ 6.71 per ton

Takallou also projects that, with 3.5 tires being used per ton in a 2% rubber RUMAC mix, all of the 12 million scrap tires generated annually in New York State could be recycled into RUMAC for half of NYSDOT's annual asphalt surface and binder paving, at a cost of $1.21 per tire - far below the $11.00 per tire that NYSDOT has continued to project from 1986 through today.

Any comparison of costs between RUMAC and conventional asphalt is incomplete unless it also acknowledges the economic benefits attached to the use of RUMAC, and the NYSDOT report fails to provide any such acknowledgement. These economic benefits include the following: a) RUMAC is lighter than conventional asphalt, yet it carries more volume. Therefore, more paving material (approximately +6.5%) is produced per ton than conventional asphalt; b) The ability of RUMAC to perform as well or better than conventional asphalt at reduced thicknesses (of around 30%) is a further cost savings over conventional asphalt. Therefore, not only does RUMAC yield more paving material per ton, but this material can be even more economical when applied at reduced thicknesses. Such applications have proven successful in a variety of tests, including locations in Washington State, Northern California, and throughout the City of Newark, NJ; c) There is evidence of RUMAC's overall superior fatigue life performance, whether at reduced thicknesses or not, both through field tests and lab tests. The resulting longer road life provides further savings; d) The routine use of RUMAC by New York State on State roads would, through the use of scrap tires, save state and local government funds currently expended in the regulation of tire dumps, the eradication of fires, vector control at such dumps, and the cost of disposing of scrap tires (which can range from $.50 to $2.00 per tire.)

FINDINGS AND RECOMMENDATIONS

1) Over two billion scrap tires are currently stockpiled across the United States,[86] with an additional 279 million tires added to the national scrap tire total every year.[87] In New York, the Department of Environmental Conservation estimates that as many as 100 million scrap tires are now stockpiled,[88] with an additional 12 million generated each year.[89] These stockpiles are both a blight on our landscape and a serious threat to the public health and the environment. Fires in tire dumps wreak havoc and are costly to contain and clean up. In addition, tire dumps are an ideal breeding ground for disease carrying mosquitos.

To date, New York State's response to the scrap tire issue has included: 1) a 1987 DEC and DOT-sponsored conference on "Waste Tires in New York State: Alternatives to Disposal"; 2) the regulation of tire dumps by DEC as of August, 1989, required under Chapter 88 of the Laws of 1989. DEC regulations for tire dumps or "waste tire storage facilities" under Part 360-13 require anyone storing more than 1000 scrap tires to obtain a permit to operate; and 3) the regulation of scrap tire haulers, as of January, 1991, required under Chapter 226 of the Laws of 1990. DEC permitting of scrap tire haulers will apply to anyone transporting scrap tires for a fee.

Although the State has acted to regulate tire dumps and scrap tire haulers, the environmental threats presented by continued stockpiling of tires requires further State action to provide useful alternatives to such stockpiling.

2) Two of the leading options that presently have the potential to utilize substantial amounts of scrap tires are: 1) recycling the tire by adding granulated tire rubber to asphalt paving material; and 2) incinerating whole tires for energy recovery.

The first option, recycling scrap tires through the addition of rubber to asphalt paving material, has been tested by a variety of states over the last 20 years with generally good results. There are two applications of rubber in asphalt: the wet process or "Asphalt Rubber," (AR) and the dry process or "Rubber-Modified Asphalt Concrete" (RUMAC).

It is estimated that the application of RUMAC in half of the 6.256 million tons of asphalt used annually in New York for surfacing and binder courses (wearing surface and inner pavement) on state roads, would consume the entire 12 million scrap tires generated annually in New York State.[90]

The second option, tire incineration for energy recovery, has been proposed in New York State by Oxford Energy Co. for Lackawanna in Erie County. That plant is projected to burn 11.8 million scrap tires annually. Oxford currently operates a scrap tire incineration facility in Modesto, California, which burns 4.6 million tires annually, and is planning to open a second facility in Sterling, Connecticut, which is projected to burn 9 million scrap tires annually.

New York State's waste management hierarchy emphasizes reuse and recycling ahead of disposal options (incineration and landfilling.) The State should, therefore, encourage the recycling and secondary use of scrap tires over their disposal. Recycling scrap tires through routine use of rubber in asphalt paving applications for State roads should be the "next step" in State action on the scrap tire issue.

3) Pursuant to Chapter 599 of the Laws of 1987, the New York State Department of Transportation conducted a test of RUMAC on state roads. This NYSDOT project produced the very first non-proprietary mix of RUMAC ever used, now referred to nationally as the "New York Mix." In September, 1990, (seventeen months after the statutory deadline for submission had passed) NYSDOT issued an eleven page report to the Governor and the Legislature on the use of RUMAC. As documented in this report, the NYSDOT study, entitled, "Use of Scrap Tire Rubber in Asphalt Pavements," contains numerous mischaracterizations and lacks a detailed economic analysis to justify NYSDOT's extremely high cost projections for the application of RUMAC.

NYSDOT contracted with a private engineering firm for approximately $100,000 to produce a report on the RUMAC project, which the Department chose not to issue as the project report. Instead, six months after NYSDOT received the final copy of the engineers' report, they produced their own report, unattributed to any author(s), and completely lacking the detail and analysis contained in the engineers' report.

The report submitted by NYSDOT in compliance with the 1987 Law has severely limited the credibility of the Department with regard to determining the potential for utilizing RUMAC on State roads. In fact, on the basis of the NYSDOT study, as well as candid conversations with certain Depart[illegible]OT appears bent on limiting potential for further RUMAC use.

4) At present, there are two main barriers to the use of RUMAC. The first is its cost over conventional asphalt applications. While the addition of rubber to asphalt for the production of RUMAC (and AR) does involve some additional costs, (for RUMAC, one recent estimate puts that cost at $6.71/ton or $1.21/each tire used)," any cost comparison should also acknowledge the *economic benefits* involved in the use of rubberized asphalt, which can certainly offset such cost increases. The NYSDOT report on RUMAC fails to provide any such analysis. These economic benefits include the following: a) RUMAC is lighter than conventional asphalt, yet it carries more volume. Therefore, more paving material (approximately +6.5%) is produced per ton than conventional asphalt; b) The ability of RUMAC to perform as well or better than conventional asphalt at reduced thicknesses (of around 30%) is a further cost savings over conventional asphalt. Therefore, not only does RUMAC yield more paving material per ton, but this material can be even more economical when applied at reduced thicknesses. Such applications have proven successful in a variety of locations, including a Federal Highway Administration project in Washington State, Northern California, and throughout the City of Newark, NJ; c) There is evidence of RUMAC's overall superior fatigue life performance, whether at reduced thicknesses or not, both through field tests and lab tests. The resulting longer road life provides further savings; d) The routine use of RUMAC by New York State on State roads would, through the use of scrap tires, save state and local government funds currently expended in the regulation of tire dumps, the eradication of fires, vector control at such dumps, and the cost of disposing of scrap tires (which can range from $.50 to $2.00 per tire.)

The second barrier to expanding the use of RUMAC, as articulated by the Michael Heitzman of the Federal Highway Administration, involves questions as to the "recyclability" of asphalt pavement containing rubber. Increasingly, old asphalt pavement needing replacement is taken off the road, heated and mixed with a certain percentage of new asphalt, and reapplied or "recycled" back onto the road. Because existing RUMAC applications around the country have not yet met the end of their service lives, the "recyclability" of RUMAC pavement is unknown at present. State and local governments have been understandably reluctant to incur the costs associated with sacrificing perfectly good RUMAC pavements in order to test the material's recyclability. However, this coming spring, such testing is due to occur on a RUMAC project in Ontario, Canada.

Field tests over the past ten years, including recent NYSDOT applications, show RUMAC performing as well or better than conventional asphalt applications. Asphalt Rubber (AR) has met with similar results. Because these materials have tested well against conventional asphalt, and because the use of RUMAC and AR will provide a needed market for beneficial reuse of scrap tires and reduce our scrap tire stockpiles, the use of RUMAC and AR by the State should become widespread.

The as yet unresolved matter of RUMAC's recyclability is not, according to the FHWA, a barrier to any state receiving federal funds for experimental RUMAC projects; nor should it be a barrier to New York State expanding its use of RUMAC. The NYSDOT should undertake an expanded program of RUMAC test projects around the State. By 1997, NYSDOT and the Thruway Authority should be required to use RUMAC on at least 50% of their state road paving projects. NYSDOT and the Thruway Authority should also begin to experiment with the use of Asphalt Rubber (AR) as a crack/joint sealant, surface treatment, and a hot mix.

Cost increases that may be incurred early on by DOT and the Thruway Authority as a result of the RUMAC and AR applications, could be offset by the enactment of a $2.00 surcharge on all new tires sold in New York State. A tire surcharge measure has been proposed in Assembly for the last four years, and by the Governor for the last three years. Such a measure would raise approximately $26.2 million annually.

5) Currently, no State plan exists to provide a remedy to scrap tire stockpiles or to utilize the millions of scrap tires generated annually.

A meaningful State plan for managing scrap tires must be developed. The Departments of Transportation, Economic Development, and Environmental Conservation should be charged with the development of a Scrap Tire Utilization and Management Plan, which would incorporate the following: 1) Creation of a demand for crumb rubber from scrap tires through a RUMAC and AR utilization plan by NYSDOT and the Thruway Authority. Such a plan should contain yearly goals and timetables for meeting a 1997 goal to use RUMAC on at least 50% of state road paving activities; 2) To assist in the development of a crumb rubber supply, and to encourage other recycling opportunities for scrap tires, an outreach plan as well as a grant and loan program by DED. Such a plan and program should have as its goal the establishment of the necessary infrastructure to further in-state tire recycling opportunities; and 3) To promote the proper management of scrap tires, a comprehensive regulatory plan by

DEC. Such a plan should provide a "census" of current tire stockpiles and annual scrap tire production, seek to clean up any unpermitted scrap tire storage facilities, promote information regarding the proper handling of scrap tires and the best management methods, and determine the feasibility of using shredded or ground rubber from scrap tires as an allowable landfill cover material.

6. Federal funds for state roadwork typically provide 50% of a state transportation department's roadwork revenues annually.[22] However, because the Federal Highway Administration (FHWA) has not yet determined the performance feasibility of RUMAC and AR, despite over ten years of study, federal funds for state use of RUMAC and AR are only available for experimental projects accompanied by an experimental work plan, which outlines a plan for pre-construction, construction, and post-construction evaluation of the project. States such as Alaska and California have requested that the FHWA approve AR and RUMAC as a "suitable policy option," which would mean that routine application of RUMAC or AR on state road projects could qualify for federal funds the same as conventional asphalt projects. So far the FHWA has denied such requests.

The FHWA policy that denies federal funds for *routine use* of "rubberized asphalt" paving applications must be changed if New York State is to move ahead in greatly expanding its use of scrap tires in asphalt. The Federal Highway Administration must move ahead in its evaluation of RUMAC and AR projects *and* immediately provide increased funds to states for the expanded testing and evaluation of RUMAC and AR projects. Within two to three years, the FHWA should have had ample time to evaluate the performance and cost of RUMAC and AR projects that have been applied within the last 10 - 15 years. Then, based on field performance results, and consideration of avoided cost benefits, the FHWA should be able to make a favorable determination to allow the use of RUMAC and AR to be classified as a "suitable policy option," which would provide New York and other states with federal funding for the routine use of these materials.

CONCLUSIONS

Despite NYSDOT's unwillingness to utilize RUMAC beyond the two pilot project applications in 1989, the NYSDOT RUMAC project has provided an opportunity for the State to **genuinely manage** its burgeoning scrap tire population, rather than continuing the unsound practices of landfilling and stockpiling this resource.

Our millions upon millions of scrap tires are a blight on the landscape of New York State, and a looming environmental threat. Rather than ignoring the problem until the next costly tire dump fire disaster occurs, the State must take action to better manage scrap tires. This report recommends the following future directions:

▸**Develop and implement a State Scrap Tire Utilization and Management Plan.** The program elements of such a plan would charged to NYSDOT, DED, and DEC, and should include:

1) Provisions for NYSDOT to begin an expanded testing program of RUMAC around the State, with a goal of recycling 12 million scrap tires annually by 1997 through use of RUMAC on at least half of the surface and binder courses paved annually by the State through asphalt applications.
2) Promotion by DED of a scrap tire recycling infrastructure to produce the crumb rubber supply and quality necessary to meet State demand and specifications for RUMAC applications.
3) Development of a comprehensive regulatory plan by DEC to fully inventory scrap tire stockpiles and the number of scrap tires produced annually; enforce the clean-up of unpermitted tire stockpiles; and provide better information to the public and private sectors regarding state requirements for scrap tire transport and storage, as well as the best management options available for scrap tires.

▸**Enact a $2.00 dedicated surcharge on all tires sold in New York State in order to fund program elements of the Scrap Tire Utilization and Management Plan.** Revenues from such a surcharge are estimated at $26.2 million annually. The vast majority of these revenues could be used to offset the estimated 20 - 30% cost increase associated with use of RUMAC over conventional asphalt. Tire surcharges have been implemented by an increasing number of states, and range from .$25 - $2.00 in the U.S., while Ontario has recently implemented a $5.00 per tire surcharge.

LCSWM staff recommend legislation requiring the elements listed above be introduced by the Chairman for the 1991 New York State Legislative Session.

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APPENDICES

GLOSSARY OF TERMS

Asphalt Rubber (AR)-A proprietary mix of asphalt and rubber blended at high temperatures. The rubber acts as a binder to hold aggregate. It can be applied as a joint/sealer, surface treatment, or in a hot mix.

Chip seal or seal coat-A type of surface treatment, or thin layer of pavement put down to provide a new driving surface. Asphalt or AR is sprayed on the road, aggregate is dropped and then pressed into the asphalt with large rollers.

Crack/joint sealant-When Asphalt Rubber is poured into cracks in the road to fill them, it is being utilized as a crack sealer.

Dry process-Procedure used to make Rubber Modified Asphalt Concrete (RUMAC). Crumb rubber is substituted for some of the aggregate that normally is put in the mix, and asphalt, crumb rubber, and aggregate are mixed together.

Hot mix-Used to provide new wearing surface to roads. Produced when the asphalt rubber(from the "wet process") is mixed with the aggregate before application on the road.

Longitudinal cracks-Cracks found in pavement that span down the pavement in the same direction in which traffic moves.

Plusride-The name of a proprietary brand of RUMAC.

Raveling-A defect in the road. As the result of stripping or faulty application procedures the aggregate becomes separated from the pavement. When this occurs, it is sometimes said that the pavement loses aggregate.(See stripping)

Reflective cracks-Cracks in the road. They start in the base layers of the pavement and cracks upwards. They "reflect" through to crack the wearing surface.

Rutting-A defect in the road. When heavy trucks or other vehicles travel a road leaving indentations because of the weight of the vehicle. When this occurs, it is said that rutting was found.

"Rubberized Asphalt"-Refers to either Asphalt Rubber or RUMAC paving material.

Rubber Modified Asphalt Concrete (RUMAC)-Is asphalt paving material made from the "dry process" of mixing aggregate, asphalt and crumb rubber. While a proprietary brand does exist (Plusride), there are "generic" RUMAC mixes, such as the "New York Mix."

Stripping-A defect in the road from the asphalt not adhering to the aggregate.

Surface treatment-Thin layers of pavement placed to maintain roads. A chip seal is a type of surface treatment.

Transverse cracks-Cracks in the road which span across the lanes perpendicular to the direction that cars travel.

Wet process-Procedure utilized to produce Asphalt Rubber. Asphalt and crumb rubber are blended together for about one hour at 350 to 425 degrees fahrenheit.

The following chart indicates work done in various states using Asphalt Rubber or RUMAC. There may be other states working with these materials as well. The chart serves as an overview of the work which has been done, is being done, and will be done.

Work in Asphalt Rubber and RUMAC

State	Past use		Current/future use	
	Asphalt rubber	RUMAC	Asphalt rubber	RUMAC
Alaska		x		x
Arizona	x		x	
California	x	x	x	x
Connecticut	x		x	
Delaware	x			
Florida	x			
Georgia	x			
Indiana			x	x
Iowa		x		
Maine	x		x	
Maryland	x		x	x
Massachusetts	x		x	x
Michigan	x	x	x	
Minnesota	x	x		x
Montana		x		x
New Hampshire	x			
New Jersey	x	x		x
Ohio	x	x	x	x

Oklahoma	x	x	x	
Oregon	x	x	x	
Pennsylvania	x		x	x
Rhode Island		x		
Texas	x		x	
Virginia	x	x	x	x
Vermont	x			
Washington	x	x		

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- The Department of Transportation (DOT) shall undertake efforts including research and consultation with DEC and DED to address any technical or economic impediments to the use of recycled glass, rubber and other materials as components in paving materials and shall identify measures to overcome such impediments.

- The Department of Economic Development shall work jointly with DOT and industries toward developing within the State supply sources of recycled materials for use as components of paving materials which meet specifications as established pursuant to this Order. In addition, DED shall prepare a report, in consultation with DEC, that outlines the issues and quantifies the avoided costs in connection with the use of recycled materials as components of paving materials. Such report shall be completed by September 1, 1991.

- The Department of Transportation shall establish, no later than July 1, 1991, specifications and engineering guidelines for the beneficial use of recycled glass and rubber as components in paving materials for road construction. Such specifications and guidelines shall be developed after consultation with DED, DEC and DOH and shall be approved by OGS. All appropriate State agencies shall give preference to these approved specifications and guidelines beginning July 1, 1992 as long as the materials meeting the approved specifications and guidelines can be obtained within available funding and consistent with program requirements.

II. PROGRAM DESCRIPTION

Submission of Annual Reports

A. All State agencies shall report annually on the recycled paper and recycled products purchased by that State agency and the waste reduction activities implemented and planned. Such report shall describe the agency's efforts regarding at least the following: Waste Reduction Activities - existing status and proposed activities; Recycled Product Procurement - description and quantities; Waste Recycling Activities - description and quantities; Incentives and Disincentives to Waste Reduction and Recycling; and Recommendations for Additional Measures to Encourage Wise Use of the State's Resources.

B. Each agency shall prepare its first annual report by August 1, 1991, and shall prepare such reports annually thereafter for the preceding fiscal year. These reports shall be submitted to OGS with copies to DEC and DED.

C. Each State agency shall provide to OGS a description and detail of quantities of all recycled paper products purchased under the provisions of the Solid Waste Management Act of 1988 and this Executive Order which have not been purchased through OGS contracts.

III. OFFICE OF GENERAL SERVICES PROGRAM RESPONSIBILITIES

The Office of General Services shall:

A. Provide, in cooperation with DEC and DED, technical assistance to State agencies in identifying and reviewing products that contain secondary materials and in determining their availability, adequacy for the purposes intended and price; and

B. Identify products that contain secondary materials that may be appropriate for use and purchase by State agencies and furnish such information to DED.

IV. DEPARTMENT OF ENVIRONMENTAL CONSERVATION RESPONSIBILITIES

The Department of Environmental Conservation shall:

A. Provide technical assistance to State agencies on products and materials that contain secondary materials through its consumer awareness program;

B. Provide education and assistance to State agencies to establish and promote recycling programs within their facilities;

C. Provide education and assistance to State agencies concerning regulatory requirements applicable to the initiatives proposed in this Executive Order;

reduce the toxicity of dry-cell batteries and to encourage the recycling of such batteries; and

E. Through participation in the CONEG Source Reduction Council, urge expeditious implementation by industry of guidelines to reduce the quantity of materials used in packaging.

V. DEPARTMENT OF ECONOMIC DEVELOPMENT RESPONSIBILITIES

The Department of Economic Development shall:

A. In cooperation with DEC and OGS, compile and maintain a list and related information on products that contain secondary materials and provide such information to State agencies;

B. In cooperation with DEC, establish a Task Force to develop a plan to reduce the toxicity of dry-cell batteries and to encourage the recycling of such batteries;

C. Provide assistance to State agencies and the private sector in identifying and establishing markets for recyclable materials collected through their recycling programs;

D. Through participation in the CONEG Source Reduction Council, urge expeditious implementation by industry of guidelines to reduce the quantity of materials used in packaging; and

E. Upon adoption by CONEG of preferred packaging guidelines, compile a list of participating companies and their products that meet or exceed the guidelines and disseminate such list to all State agencies.

VI. DEPARTMENT OF TRANSPORTATION RESPONSIBILITIES

The Department of Transportation shall:

- Provide technical assistance and guidance to State agencies and local governments on the use of recovered glass, rubber and other materials for road construction.

VII. DEPARTMENT OF AGRICULTURE AND MARKETS

The Department of Agriculture and Markets shall:

- In cooperation with DEC and DED, and in consultation with the College of Agriculture and Life Sciences Cooperative Extension, and Soil and Water Conservation Districts, provide technical assistance and guidance to State agencies and local governments on developing and using compost and mulch as soil amendments and for soil moisture conservation.

VIII. PUBLIC AUTHORITIES AND PUBLIC BENEFIT CORPORATIONS

- Public authorities and public benefit corporations are urged to undertake waste reduction and recycling efforts consistent with the provisions of this Order.

G I V E N under my hand and the Privy Seal of
the State in the City of Albany
this sixteenth day of January in
the year one thousand nine hundred
ninety-one.

(L.S.)

BY THE GOVERNOR /s/ Mario M. Cuomo

/s/ Gerald C. Crotty
Secretary to the Governor

State of New York

Executive Chamber

No. 142

EXECUTIVE ORDER

ESTABLISHING NEW WASTE REDUCTION AND RECYCLING INITIATIVES FOR STATE AGENCIES

WHEREAS, waste reduction and recycling are the highest priorities for solid waste management in New York State;

WHEREAS, increasing pressures upon New York State's solid waste disposal capacity require cooperation by all New Yorkers to reduce our dependence on landfills and other disposal facilities;

WHEREAS, the Solid Waste Management Act of 1988, Chapter 70 of the Laws of 1988, requires all State agencies to institute a program to source separate waste paper generated within state facilities by July 1, 1989, and to source separate by July 1, 1990, all other wastes generated within such facilities for which the full avoided costs of proper collection, transportation and disposal of source separated material are equal to or greater than the cost of collection, transportation and sale of the recovered material less the amount received from the sale of such material;

WHEREAS, the Solid Waste Management Act of 1988 also requires all public authorities, corporations, and commissions to source separate waste paper by July 1, 1990, and requires such public authorities, corporations, and commissions by July 1, 1991, to source separate all other wastes generated within their facilities for which the full avoided costs of proper collection, transportation and disposal of source separated material are equal to or greater than the cost of collection, transportation and sale of the recovered material less the amount received from the sale of such material;

WHEREAS, the purchase of recycled products is necessary to ensure a market for source separated materials, and State agencies are a major purchaser of products;

WHEREAS, government must operate as an example to all New Yorkers that waste reduction and recycling are essential elements of natural resource conservation and of the State's integrated solid waste management program;

NOW, THEREFORE, I, MARIO M. CUOMO, Governor of the State of New York, by the authority vested in me by the Constitution and Laws of the State of New York, do hereby direct all State agencies to undertake those efforts necessary to maximize all opportunities to reduce the amount of solid waste generated, to recycle material recoverable from the solid waste originating at their facilities, and to maximize the procurement of recycled products.

I. PURPOSE AND OBJECTIVES

The purpose of this Order is to establish a program which will strengthen the State's commitment to waste reduction and recycling through increased effort at all State facilities to reduce waste generation, to source separate recyclable materials from the workplace wastestream, and to maximize the procurement of recycled products.

Toward that end, New York State agencies shall institute the following practices:

- All State agencies not presently obligated to institute source separation programs shall, no later than April 1, 1991, institute a program to source separate waste paper generated within their facilities, regardless of whether such facilities are owned by the State or are buildings leased and operated by the State, and such source separation programs shall be included in all new and renewed leases entered into by the State where feasible.

- All State agencies not presently obligated to institute source separation programs shall, no later than January 1, 1992, institute a program to source separate all other wastes generated within their facilities, regardless of whether such facilities are owned by the State or are buildings leased and operated by the State, and such source separation programs shall be included in all new and renewed leases entered into by the State where feasible.

- All State agencies obligated to institute source separation programs shall, through employee education and installation of necessary equipment, maximize their source separation programs for waste paper and all other wastes generated within their facilities, regardless of whether such facilities are owned by the State or are buildings leased and operated by the State, and such source separation programs shall be included in all new and renewed leases entered into by the State where feasible.

- All State agencies shall use recycled paper for letterhead and other paper uses unless the Office of General Services (OGS) determines that recycled product is not available, is inadequate for the purpose intended, or that the cost of the recycled paper exceeds the cost of the non-recycled paper by more than ten percent.

- All State agencies shall, consistant with applicable law, purchase recycled products made from secondary materials, other than paper products, unless the purchasing agency determines that no recycled product is available, or is inadequate for the purpose intended, or that the cost of the recycled product is not competitive. State agencies shall, if permitted by law, purchase recycled products displaying the New York State recycling emblem, when adopted. Recycled product shall mean any product which has been manufactured from secondary materials as defined in subdivision one of section two hundred sixty-one of the Economic Development Law.

- Upon adoption by the Coalition of Northeastern Governors (CONEG) Source Reduction Council of a program for industry implementation of preferred packaging guidelines, all State agencies, wherever permitted by law and where feasible, shall purchase products marketed in conformance with such guidelines.

- All State agencies shall use locally available compost, mulch and soil amendments produced from secondary materials, as defined by the Economic Development Law, provided the products meet State specifications, comply with all applicable regulations, comply with Department of Environmental Conservation (DEC) requirements for use and are available at no cost or a reasonably competitive price.

- All State agencies shall undertake waste reduction and minimization efforts, which shall, at a minimum, include the use of "two-way" envelopes and the purchase and use of double-sided copying equipment and other efforts to encourage double-sided copying where reasonable.

- The Department of Economic Development (DED) and the DEC shall establish a Task Force with the dry-cell battery manufacturers to develop a plan for reducing the toxicity of such batteries and for developing methods and policies to achieve recovery of the batteries and the recycling thereof. DED and DEC, in consultation with the Department of Health (DOH), shall prepare, no later than January 1, 1993, a final plan regarding dry-cell batteries toxicity reduction and recycling. The plan shall include a schedule for the development of collection systems capable of providing for the return of all dry-cell batteries sold in New York State by no later than January 1, 1995, and procedures for reducing, to the maximum extent practicable, dry-cell batteries as wastes by no later than January 1, 2000.

HIGHWAYS—USE OF SCRAP RUBBER IN CONSTRUCTION AND IMPROVEMENT

CHAPTER 599

Approved and effective Aug. 3, 1987

AN ACT to amend the highway law, in relation to the utilization of scrap rubber in the construction and improvement of highways

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

§ 1. Legislative intent. The legislature finds that the environmentally acceptable disposal of used motor vehicle tires within the state cannot be accomplished by landfilling or incineration techniques commonly employed in the disposal of municipal solid waste. The lack of disposal options and of markets for scrap tires has resulted in the stockpiling of large quantities of tires in locations across the state. Such stockpiles pose a potential environmental and health hazard.

The legislature further finds that the reuse of scrap rubber in paving materials in the construction or improvement of highways is a promising commercial process, which has been increasingly employed in highway construction in other states.

The legislature duly notes that the concept of the use of scrap rubber derived from used motor vehicle tires in the construction of highways has been endorsed by the federal government. The 1982 Surface Transportation Assistance Act[1] contains incentives to state governments to encourage the use of recycling and use of various additives in asphalt construction, of which rubber is one. The New York state department of transportation has used rubber in asphalt construction experimentally, allows its use in curbing mix, and for other uses.

In recognition that recent research shows that rubber-modified asphalt paving material may add to the life and safety of public highways, and in recognition that New York state should consider utilizing this material in some beneficial way that will help to eliminate a potential hazard to public health and to the environment, the legislature hereby enacts the following provisions.

[1] 23 U.S.C.A. § 101 et seq.

§ 2. The highway law is amended by adding a new section twenty-three to read as follows:

§ 23. Rubber-modified asphalt pilot project

1. The commissioner shall undertake in nineteen hundred eighty-eight, a pilot project for the utilization of rubber-modified asphalt in the construction or improvement of state highways. Such rubber-modified asphalt pilot project shall utilize rubber derived from motor vehicle tires discarded in the state, including but not limited to use in granulated form as a percentage of asphalt mix and use as a joint material, and may be required in a contract or contracts for capital construction or improvement of highways in fiscal year nineteen hundred eighty-nine.

2. On or before April first, nineteen hundred eighty-nine, the commissioner of transportation shall submit a report to the governor, to the speaker of the assembly and to the president pro tem of the senate. In making such report, the commissioner may make use of and report on existing studies, analyses and pilot projects conducted within or outside the state by other states or the federal government, along with any other sources of information he deems appropriate. Such report shall include a summary and analysis of the procedures and results of the pilot project, including the following:

(a) a comparison of costs of conventional asphalt mixes to the costs of the use of rubber-modified asphalt;

(b) a comparison of the application methods of conventional paving materials to rubber-modified asphalt and the ability to adapt equipment and processes, if necessary, to incorporate rubber in asphalt mix to the commissioner's specifications;

(c) performance of rubber-modified asphalt as compared to conventional materials with regard to longevity of pavement, traction, road glare, icing, and such other characteristics as may be deemed appropriate by the commissioner;

(d) the findings of the commissioner as to the optimum and appropriate percentage of scrap rubber in rubber-modified asphalt paving mixtures for construction or improvement of state highways in consideration of projected performance, safety and costs;

(e) the quantity of rubber that would be used annually if the percentage of rubber content recommended by the commissioner were to be utilized in rubber-modified asphalt paving mixtures for all contracts for the construction or improvement of state highways or sections thereof;

(f) existing or potential impediments to the maximum utilization of rubber-modified asphalt in contracts for the construction or improvement of state highways;

(g) recommendations of the commissioner as to future actions that could be taken by the department of transportation, the governor and the legislature to facilitate the use of scrap rubber for highway construction or improvement;

(h) an analysis of the potential for the use of rubber-modified asphalt by local governments, regional and statewide authorities governing the construction or improvement of highways or bridges, including, but not limited to:

(i) the projected annual demand for scrap rubber by local governments, regional and statewide authorities, based upon the percentage mix in asphalt for rubber derived from motor vehicle tires recommended by the commissioner; and

(ii) known or anticipated impediments to the maximum utilization of rubber-modified asphalt by local governments, regional and statewide authorities.

3. The commissioner shall further examine, and make recommendations regarding the following:

(a) actions that may be necessary to ensure the availability of an adequate supply of scrap rubber to meet projected demand in the construction or improvement of public highways; and

(b) an estimation of the additional expense, if any, to the state or localities in the utilization of rubber-modified asphalt technologies.

4. In the preparation of this report the commissioner shall consult with the county and other state governments, the New York state thruway authority, the port authority of New York and New Jersey and such public or private agencies as the commissioner deems appropriate.

§ 3. Section thirty-eight of such law is amended by adding a new subdivision two-a to read as follows:

2-a. Contracts; rubber-modified asphalt materials. In regard to contracts for construction or improvement of highways incorporating the use of asphalt construction materials after May first, nineteen hundred eighty-nine, the commissioner may require that the paving materials incorporate a percentage of scrap rubber derived from motor vehicle tires discarded in the state. Such percentage of rubber additives may be established by the commissioner subsequent to the completion of a rubber-modified asphalt pilot project to be conducted pursuant to section twenty-three of this chapter.

§ 4. This act shall take effect immediately.

RMA.

RUBBER MANUFACTURERS ASSOCIATION
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Statement of the Rubber Manufacturers Association

Submitted to the

Subcommittee on Transportation and Related Agencies

Committee on Appropriations

United States House of Representatives

May 12, 1993

The Rubber Manufacturers Association understands that the Transportation Subcommittee is presently reviewing Section 1038 of the Intermodal Surface Transportation Efficiency Act of 1991, (ISTEA). The Association, on behalf of its member tire companies, would like to submit for the record comments addressed to two limited issues with respect to this legislation.

The Rubber Manufacturers Association (RMA) is the principal trade association representing the tire and rubber products industry in the United States. Its more than 150 member companies produce various types of rubber goods, including tires and innertubes, hoses and belts, molded and extruded products, single-ply roofing, sealing products, apparel and sundries. RMA's membership accounts for nearly 90 percent of the production of rubber goods in the United States. The RMA supports all safe and environmentally sound alternatives for reuse or recycling of scrap rubber materials.

1. Scheduled Studies

Section 1038 sets forth a program to require the states to utilize ground rubber derived from scrap tires in asphalt paving materials used in federal aid highway construction programs. During the Congressional deliberations over this section, several important questions were raised about some aspects of the use of scrap tire derived crumb in asphalt paving. Accordingly, the legislation, in Section 1038 (b), requires a set of studies to be made and a timetable for those studies. In Section 1038 (c)(5) the legislation sets forth authority for making waiver decisions based on the results of these studies.

We believe that the studies required by Congress in Section 1038 and the opportunity for waiver decisions based on good science contained in those studies, is appropriate to develop sound answers to the questions raised. We further believe that these studies should go forward as mandated by Congress and that the responsible agencies produce the reports and make decisions based on the merits of the findings.

2. Inaccurate and Misleading Data with Respect to Tires

We have become aware that in the process of assembling material to carry out the mandated studies as discussed above, the Environmental Protection Agency has received erroneous information relating to tire composition from the Asphalt Institute, in a document dated April 6, 1993, with which we do not agree. The document contains false and misleading information which injects needless anxiety and alarm into the scrap tire issue.

The tire industry has developed a specific technical response to this document and has submitted it to the Environmental Protection Agency. Because we have reason to believe that this Asphalt Institute document will be introduced into the record of this hearing, we wish to be recorded as challenging its statements with respect to the impact of the composition of the tire. We have attached to, and made a part of this statement, the complete text of our response to EPA.

RMA.

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May 12, 1993

Dr. Terry Harvey, Director
Environmental Criteria & Assessment Office
U.S. Environmental Protection Agency
26 West Martin Luther King Drive
Cincinnati, Ohio 45268

Re: Evaluation Studies under ISTEA, Section 1038

Dear Dr. Harvey:

The Rubber Manufacturers Association (RMA) offers the following comments in response to a letter from E. L. Miller, President of the Asphalt Institute, to Dr. T. Harvey, US EPA. Mr. Miller's letter contains erroneous and misleading statements concerning health and environmental "threats" from using scrap rubber.

RMA is a trade association representing more than 150 companies engaged in the production of various types of rubber goods, including tires and inner-tubes, hoses and belts, molded and extruded products, single-ply roofing, sealing products, apparel and sundries. RMA's membership accounts for nearly 90 percent of the production of rubber goods in the United States. The RMA is supportive of all safe and environmentally sound alternatives for reuse or recycling of scrap rubber materials, and its members are uniquely educated and qualified to address this particular issue.

Presently, scrap rubber is used safely in a variety of processes including the manufacturing of industrial, engineered, and consumer products without significant adverse health effects to workers, the public, or the environment.

We respectfully submit that Mr. Miller's evaluation of "threat" is not correct. Threat is a known and well defined hazard to human health or the environment. Risk depends on the exposure to the threat. Consequently, a threat cannot exist when there is no reliable evidence for equating the potential health effects of tire raw materials (chemicals before they are mixed and cured) to that of recycled tire crumb (from cured tires) and the use of recycled tire crumb in asphalt. The recycled tire crumb does not have the same chemical and physical properties as the raw chemicals used to manufacture the tire.

There is no information to suggest that exposure to recycled tires is detrimental to human health or the environment. Of the hazardous ingredients identified by Mr. Miller, cadmium, lead and nitrosamines are not intentionally added and, if present, would not pose a risk during use or processing of recycled tires. TCLP extractions, conducted in accordance with RCRA upon scrap tire rubber, have demonstrated that such materials are not characteristic hazardous waste. Carbon black does not survive the tire manufacturing process in its original form and would not be released. Further, the absorbed polycyclic aromatic hydrocarbons potentially on the surface of carbon black are held tightly and experiments have shown that they are not elated by a variety of biological extraction materials.

Aromatic and naphthenic oils are used in tire manufacturing; but once the rubber is vulcanized, the oil is not released from the tires. The rubber itself cannot be unvulcanized and will only undergo decomposition during combustion. Furthermore, during the use of scrap rubber for manufactured products, we are not aware of any significant release of polynuclear aromatic hydrocarbons (PAHs). In fact a study on "Paving Workers and Asphalt Emissions (When Using Asphalt-Rubber Mixes)"[1] indicated that workers' exposure to benzene and marker PAHs were on average less than 2 per cent of the OSHA PEL.

As a matter of clarification, the International Agency for Research on Cancer ("IARC") classification of the Rubber Industry as a Category I risk of cancer to humans was based on data that is now extremely out-dated and that is currently not applicable information. Further, their classification should not have been towards the entire industry but to a few limited manufacturing processes. Further substantiating the inappropriateness of the carcinogenic classification, the National Toxicology Program ("NTP") did not include the Rubber Industry in their Fifth Annual Report on Carcinogens (1989). The decision was reached after careful review of all available information and the conclusion that there was insufficient evidence to support the classification of the Rubber Industry (certain occupations) as carcinogenic.

In closing, we would like to restate that we are not aware of any long term, well established health and environmental hazards associated with the processing and use of scrap tire rubber. In fact, and in specific, we are aware of several studies on rubberized asphalt, during manufacturing and paving processes, where there are no demonstrated increases in health risks over those of asphalt alone.

Sincerely,

John R. Serumgard
Acting President

---

[1] Exposure of Paving Workers to Asphalt Emissions(When Using Asphalt-Rubber Mixes), Rinck and Napier, Asphalt Rubber Producers Group, 1991.

ARIZONA DEPARTMENT OF TRANSPORTATION

HIGHWAY DIVISION - Materials Section
1221 North 21st Avenue - Phoenix, Arizona 85009-3740

FIFE SYMINGTON
Governor

LARRY S. BONINE
Director

GARY K. ROBINSON
State Engineer

May 20, 1993

Committee on Appropriations
H218 The Capitol
Washington, D.C. 20515

Dear Sir:

Pursuant to your questions concerning Arizona's use of asphalt rubber, the following information is provided for the Committee's consideration:

- The Arizona Department of Transportation has used asphalt rubber wet process since the late 1960's.
- The primary benefits of using asphalt rubber are to reduce reflective cracking, reduce fatigue cracking, provide a moisture barrier, provide a tough and durable wearing course and to reduce noise in the urban area.
- From the late 1960's through calendar year 1992, ADOT has used approximately 45,000 tons of liquid asphalt rubber on approximately 104 projects, representing about 800 miles of highway.
- Starting in 1988, ADOT began to make use of asphalt rubber as a binder in hot mix asphalt concrete mixes. The primary use has been in gap graded and open graded mixes. The open graded mixes are referred to as ACFC's (asphaltic concrete friction course) and are placed as the wearing course, one-half to one inch thick.
- In 1992, ADOT used about 10,000 tons of asphalt rubber, primarily in ACFC's. This quantity of asphalt rubber represents about 13% of all asphalt used in 1992.
- The main reason for using asphalt rubber in an ACFC is the greater percentage of binder that can be accommodated in the mix. Typically, ACFC's have about 6 percent paving grade asphalt by weight. An asphalt rubber ACFC has 9-10 percent binder by weight. This greater quantity increases the film thickness, thus reducing aging. Since aging is reduced, the material remains softer thus reducing cracking.

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- Asphalt rubber binder typically contains at least 20 percent rubber, most of which is ground tire rubber, the remainder being natural rubber.

- ADOT's use of asphalt rubber has come about after considerable research. Attached is a list of research reports prepared for ADOT concerning asphalt rubber. Much of this research was HP&R federally funded. In addition to this research, ADOT has also constructed numerous asphalt rubber test sections in conjunction with the Strategic Highway Research Program (SHRP) test sections. These sections, along with the SHRP sections, will be monitored and evaluated to further clarify the pavement performance of asphalt rubber.

- ADOT has no data concerning air pollution measurements associated with asphalt rubber.

- ADOT has not hot recycled any asphalt rubber projects to date. The reason for this is that very few projects with asphalt rubber have needed extensive repair. For those that did need repair, the asphalt rubber has been left in place in order to act as a membrane and then overlaid.

In general, ADOT has had good experience with asphalt rubber in reducing reflective and fatigue cracking. The material, when used as a membrane or as a thin (2 inches or less) wearing course, has generally provided good performance. Over the years ADOT has continued to provide information about asphalt rubber performance to numerous interested parties, such as the FHWA, and various representatives of foreign countries. Research reports, as well as field reviews, have documented the degree of success that ADOT has had with using this product. When used properly and for the right reasons, performance in Arizona has generally been quite good.

If you need any additional information or clarification, please call.

Sincerely,

Gary K. Robinson

Gary K. Robinson
State Engineer

CLOSING REMARKS ON 1994 HEARINGS

Mr. CARR. I want to make a generic statement having to do with the series of hearings we have held in pursuit of knowledge about the fiscal year 1994 request of the President for transportation. This will be our last hearing, you will be glad to know—I am glad to know it—in this particular appropriations cycle. We have held 25 days of hearings in a very compressed time frame.

Let me boast for our committee Members and staff, the staff of Del Davis, Rich Efford, Cheryl Smith, and Linda Muir. Normally, we get a Presidential budget somewhere around the 1st of February and normally we have Secretaries and Assistant Secretaries duly appointed making the presentations. We have had virtually none of that this year and the President didn't submit his budget until April 8. We jump-started with a few hearings but we couldn't do much before April.

So we have been operating under enormous time compression. We have been meeting four days a week beginning at 9:00 and sometimes going to 7:00 or 8:00 at night without much break. My hat is off to the staff getting prepared on such a schedule.

We held 25 days of hearings in a compressed period of time. That compares to 23 days that were held in 1992 and 21 days in 1991. At the completion of the hearings today, we have heard from approximately 260 witnesses apart from the administration witnesses. That compares to about 230 congressional and public witnesses in 1992.

Last year, Chairman Lehman had to deal with the difficult problem of having requests of about $2 billion for various special projects, earmarks and the like, for a total of about $1 billion available under his discretion. For every dollar he was asked to appropriate, he could only approve 50 cents.

This year, our requests to date for earmarks, special projects and the like are $3.5 billion and we have available only a billion dollars or so under our discretion, depending on our 602(b) allocation. So this Committee has a problem that is even greater than we had last year.

But I want to take this opportunity on the record particularly to thank the staff. I don't think people understand how much work it takes to read all the testimony—I try to read as much as I can—to prepare good questions, to field all the phone calls, and to make all the arrangements.

So in the final comments of this hearing cycle, I just want to thank once again Del Davis, Rich Efford, Cheryl Smith, and Linda Muir. And I want to also say a kind word about Frank Wolf, Tom DeLay and Ralph Regula for their attentiveness to the Committee hearings. And to my colleagues on the Democratic side, Dick Durbin, and Marty Sabo who have assignments that keep them elsewhere much of the time. To my colleague, David Price who has been particularly attentive for which I am appreciative and to Mr. Coleman and Mr. Foglietta as well. I appreciate their active participation on the Subcommittee. I also want to thank the majority and minority staff: Jim Jepsen with Dick Durbin, Ellen Samuelson with Marty Sabo, Paul Feldman with David Price, Jose Sanchez with Ron Coleman, Barbara Zylinski with Tom Foglietta, Jan Powell with Frank Wolf, Glen LeMunyon with Tom DeLay, and Connie Jones with Ralph Regula for all their help. And I want to thank John Blazey for his help in the process. He is with Congressman McDade.

With that, thank you for sitting through my soliloquy. It has nothing to do with crumb rubber, but for the record I want anyone who might read this centuries from now to know those names.

Thank you. The hearing is adjourned.

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